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PROGNOSIS IN MINIMAL PULMONARY TUBERCULOSIS*

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THE diagnosis of minimal tuberculosis according to present nomenclature is based on the extent of the changes seen in an x-ray film. From the point of view of accurate diagnosis this is somewhat inadequate and in the matter of prognosis it may be quite misleading. A lesion that is minimal by x-ray appearances may be anything but minimal in significance for the patient.

Such a lesion may in due course disappear by a process of resolution, or it may fibrose, leading to arrest and eventual cure of the disease; but in another case, very similar by x-ray appearances, the lesion may be the beginning of a progressive tuberculous process in the lung calling for prolonged treatment in a sanatorium. Again it can be that a lesion diagnosed as minimal on x-ray evidence may be the precursor of a rapidly spreading tuberculous pneumonitis that in the course of a few weeks may involve an entire lung. Such an event is fortunately not common, but it may occur in a person with poor resistance as the result of rapid caseation of a lesion and bronchiogenic spread.[1]

When, therefore, a minimal lesion is observed in an x-ray film it must at least be further classified as either "probably active" or "possibly arrested". A soft-looking opacity, for instance, in a young person under 30 would suggest activity, whereas dense or calcified changes in an individual in the higher age groups might well be an arrested lesion. In any case further investigation should be carried out to confirm the status of the lesion seen in the x-ray film. To this end the following are all pertinent: inquiry into symptoms, careful records of temperature and pulse rate, estimations of erythrocyte sedimentation rate, examinations of sputum and fasting gastric contents by both concentration and culture and, most important of all, serial x-rays at two or three month intervals. Negative findings in the examination of scanty mucoid secretion obtained with difficulty are of little value. The examination of the gastric contents should by no means be omitted in any case of doubtful activity and the specimens should be cultured and also tested by guinea pig inoculation if indicated. Further, it should be emphasized that absence of subjective symptoms, normal temperature and pulse rate, normal sedimentation rate and failure to demonstrate tubercle bacilli in the secretions do not eliminate the possibility of an active lesion. Positive findings will, of course, suggest activity but it is quite possible for a minimal lesion to be active even in the presence of negative findings on all the above mentioned counts. The case of doubtful activity should be put at rest and carefully watched especially with regard to changes in the x-ray appearances. Any alteration in the extent or character of the x-ray changes is an indication of activity.

There can be little doubt, therefore, that the best place for anyone under the age of 35 with a minimal lesion of uncertain activity is in a sanatorium, where extensive investigation over an adequate period of time can establish the diagnosis and the best possible conditions will obtain for progressive healing of the lesion. The permitting of persons with minimal lesions to "continue at work and take as much rest as possible", or to take "home treatment" is to be deprecated. If the lesion is active the sooner sanatorium regimen is instituted the better. If it is inactive and arrested it is a matter of definite advantage to have this confirmed without any uncertainty. A mere impression of probable inactivity is not a sufficient safeguard either for the patient or for his contacts. Even in cases where activity at the present time can be reasonably assumed,

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the possibility of reactivation at a later date must always be borne in mind. Regular check-up x-ray examinations must therefore be insisted upon. Further, if any acute illness or infection should occur, the next x-ray examination should be carried out at an early date, for such an infection may well cause reactivation in a tuberculous lesion previously arrested or dormant.

WHAT HAPPENS TO OUR MINIMAL CASES?

In an endeavour to shed some light on this question a study has been made of a small series of "minimal cases" admitted as such to the Toronto Hospital for the Treatment of Tuberculosis, Weston, Ontario, during the years 1937 to 1943. Follow-up records were obtained, and that with some difficulty, in 100 cases. This admittedly is a very small number, but enough perhaps to act as a sample and provide a few crumbs for thought and digestion.

Five-year follow-up records were obtained in 24 cases, four-year in 25 cases, three-year in 29 cases and two-year in 22 cases, making 100 in all. From the point of view of clinical results the cases were placed in four categories, thus: "full time work", that is, those able to engage in normal avocations without apparent disability; "part time work", that is, those able to do light duties but still taking a good measure of rest; "worse", that is, those showing spread or reactivation of disease, and "died". The terms "full activity", "partial activity", would be preferable but are not used lest confusion arise between "activity" as applied to the patient and "activity" as applied to the lesion. The findings in these respects are shown in the accompanying table.

TABLE I.

CLINICAL PROGRESS

Follow-up period	*Full time work*	*Part time work*	*Worse*	*Died*	*Total*
5 years.....	17	5	..	2	24
4 years.....	21	2	2	..	25
3 years.....	21	8	..	..	29
2 years.....	12	8	..	2	22
Total.....	71	23	2	4	100

Of the four deaths in the series two were due to extension and progression of the pulmonary disease. Both were males, aged 15 and 32 respectively on admission. In each case, after an initial improvement, failure in adequate after-care brought the patient back into hospital with reactivation of the disease. In the other two fatal cases the cause of death was respectively cerebral hæmorrhage and asthma, the ages on admission being 55 and 17. The two cases reported as "worse" were both women, aged 20 and 21 respectively. Of those engaging in part time work one-half were in the 16 to 30 age group and the other half over 30 on admission. That 71% of the cases reported were in the full time work category is fairly satisfactory. It can presumably be hoped that the majority of those in the part time work group would later also be able for normal activities. This would give a total of 94% satisfactory results following sanatorium regimen and treatment with, in most cases, controlled aftercare.

ADMISSION FINDINGS

It may be of interest to review the admission findings in these patients.

Clinical type.—Fifty-five patients were symptom free on admission as regards cough, lassitude, malaise and other subjective complaints (Type A). In the other 45 cases subjective symptoms were present but usually of mild degree. Bobrowitz and Dwork in a series of 200 minimal cases found symptoms in 82%.[2] While the presence of such subjective symptoms should make one suspicious of the possibility of tuberculous disease, their absence does not exclude the possibility of an active tuberculous pulmonary lesion.

Temperature and pulse rate.—Sixty-five of the patients had slight elevation in temperature to 99° F. or over. Fifteen had a pulse rate of 90 or higher.

X-ray changes.—In 57 of the cases the changes seen in the x-ray film could be described as "soft" or mixed in type. In the remaining 43 the changes appeared rather dense. It would not be wise, however, to depend on the x-ray appearances alone for the verdict as to activity or otherwise. In some of the cases where the x-ray appearances were suggestive of old, possibly healed disease there were signs of activity such as persistent elevation of temperature or positive laboratory findings. It was noted that in 41 cases the lesion was unilateral and on the right, in 30 cases unilateral and on the left and in 29 cases, bilateral. In only 2 cases in the series was the lesion basal.

Laboratory findings.—Examinations of sputum and fasting gastric contents yielded no positive

findings in 77 cases. Sputum findings were, however, obtained in 23 cases: 8 cases, positive on direct smear; 4 cases, positive on concentration; 3 cases, positive on culture; and 1 case positive on bronchoscopic examination. These were all sputum examinations. In an additional 7 cases tubercle bacilli, though not demonstrated in the sputum, were found, nevertheless, in the fasting gastric contents. It is possible or probable that with more diligent searching a higher percentage of positive findings might have been obtained. In the above mentioned series of Bobrowitz and Dwork[2] tubercle bacilli were found in 21%. While these results indicate that cases of minimal tuberculosis are as a class not highly infective, the fact that the presence of tubercle bacilli was demonstrated in the secretions of 23% of the cases is a warning that even the minimal case may be a menace to others. With regard to the sedimentation rate this was within normal limits in 63 cases, above normal but below 50 in 32 cases, and over 50 in 5 cases. These figures are probably of not much significance as in this type of case a high rate may easily be due to some intercurrent cause and not to the tuberculous infection.

Age on admission.—As would be expected the majority of the cases were in the 16 to 30 age group, namely 59 cases. There were 21 cases in the 31 to 50 age group, 10 cases under 16 and 10 over 50. That 31 cases were over the age of 30 would indicate that we should not relax our vigilance in seeking to detect the minimal case because the individual is no longer in the younger age groups. It should be noted that in this series, cases of primary infection, childhood type, were not included. Those in the under 16 age group were all diagnosed as minimal pulmonary tuberculosis.

Sex distribution.—Female patients predominated in this series numbering 62 to 38 males. In the under 16 group there were 6 boys and 4 girls. In the 16 to 30 age group there were 43 women and 17 men. In the groups over 30 there were 15 men and 15 women. It is a common finding that cases of active tuberculosis are more common in women than in men in the under 30 age group. In the higher age groups, however, the disease seems to be diagnosed much more frequently in the male sex. In a recent survey of 1,000 admissions to sanatorium for all types of pulmonary tuberculosis the male cases over 30 years of age numbered 353 as against 137 women in the same group.[3] The sex-age factor in tuberculosis would, therefore, suggest a very definite indication to protect women in the younger age groups from undue stress and strain whereby their resistance to tuberculous infection might be impaired. The same would apply to men in the higher age groups. This angle of prophylactic care needs to be stressed particularly in connection with persons who have once had active pulmonary tuberculosis, even if the lesion was minimal. The power of the body to resist tuberculous infection, both natural and acquired resistance, is not a fixed but a fluctuating asset.[1] It should be conserved by careful habits of living in every respect.

TABLE II.

TREATMENT WHILE IN SANATORIUM

Progress group	*Full time work*	*Part time work*	*Worse*	*Died*	*Total*
Bed rest only.	31	12	..	2	45
Phrenic nerve crush.....	33	3	..	1	37
Artificial pneumothorax...	14	5	2	1	22
Operative collapse....	5	..	..	..	5
Average stay in months..	9.4	8.6	12.0	17.5	

No very definite conclusions can be drawn from these data. It is possible that some of those in whom phrenic nerve crush was performed might have done quite well without the use of this procedure, which does carry with it some risk of permanent diaphragmatic paresis. It would seem likely that many minimal cases might heal by natural processes under sanatorium rest treatment. Some form of pulmonary collapse can be employed for those cases in which extra aid is needed to swing the balance in favour of recovery. The stay in hospital in most cases was well over six months but under a year. For minimal cases, who are often feeling remarkably well, a prolonged stay in hospital may be irksome, but it is certainly of great value both in initiating the process of healing and in consolidating the progress made towards final recovery.

X-ray progress.—Follow-up information in this respect was not fully available. Recent records were obtained in 77 cases with the following results. In 45 cases the x-ray showed no appreciable change or was reported as "satis-

factory''. In 25 cases there was disappearance of the lesion either partial or complete. In 7 cases extension of the lesion was noted. There did not seem to be any particular correlation between these findings and the form of treatment employed. It must be emphasized that any alteration in the x-ray picture indicates activity, whereas the finding of ''no appreciable change'' can usually be regarded as a sign of arrested disease, other evidences of inactivity being in accord.

TABLE III.

PERCENTAGE COMPARISON OF X-RAY FINDINGS

	Location of lesion		
	Unilateral right	*Unilateral left*	*Bilateral*
In 100 sanatorium patients.....	41%	30%	29%
In 60 non-sanatorium cases..	50%	25%	25%

TABLE IV.

	Follow-up records		
	No change	*Regression*	*Extension*
In 77 sanatorium patients.....	58%	32%	10%
In 37 non-sanatorium cases..	65%	27%	8%

The above x-ray findings, for what they are worth, would appear to indicate a tendency for the minimal lesion to be unilateral and to show a preference for the right upper lung area. As regards x-ray progress, actual disappearance of the markings is not as frequent a finding as ''persistence of the changes with no appreciable change in their appearance''. This latter finding is, however, to be regarded in most cases as satisfactory if all other signs of activity have subsided.

CONCLUSIONS

1. Pulmonary tuberculosis when diagnosed in the minimal stage is a disease with a good prognosis.

2. The safe procedure for every case of minimal tuberculosis of probable activity, or of doubtful inactivity, is admission to a sanatorium.

3. In a sanatorium competent investigation can be carried out, expert opinion can be brought to bear on the case, and adequate measures can be employed to supplement simple bed rest as indicated.

4. A certain proportion of minimal cases have tubercle bacilli demonstrable in their secretions. This further emphasizes the desirability of admission to sanatorium, *i.e.*, from the public health angle.

5. In minimal tuberculosis collapse therapy should probably not be instituted too precipitately, but it should not be withheld when indicated.

6. Every effort should be made and no expense spared in the endeavour to diagnose tuberculosis of the lungs in the minimal stage by x-raying more and more chests, and by repeatedly x-raying the same chest when indicated over a long period of years.

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RÉSUMÉ

Diagnostiquée précocement, la tuberculose pulmonaire comporte un pronostic favorable. Tout malade atteint de t.b. pulmonaire débutante doit demander son admission dans un sanatorium où les divers tests de routine seront faits et où le repos au lit sera institué, le cas échéant, comme mesure supplémentaire. Comme plusieurs tuberculeux débutants ont des expectorations bacillifères, il importe de les isoler au sanatorium au plus tôt. C'est à ce moment qu'il importe d'instituer le pneumothorax si l'étude du malade en précise l'indication, et de demander à la radiologie son aide totale et à répétition tant que persiste le doute sur l'évolution de la maladie. Ces radios devront se répéter aux cours des années subséquentes tant qu'il existe un doute de maladie évolutive.

JEAN SAUCIER

A SIMPLE AND EFFICIENT METHOD OF TREATMENT OF FRACTURES INVOLVING THE ANKLE*

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EVER since Percival Pott, surgeon, of St. Bartholomew's Hospital, London, in his ''Some Few General Remarks on Fractures and Dislocations'' (London, 1769) first described a type of fracture-dislocation of the ankle, few fractures have been the object of more attention than those involving the ankle joint. Such attention has inevitably led to great advances in their management. Nevertheless, one is struck by the number of patients who apply for treat-

* From the Surgical Services of Dr. Fraser B. Gurd, the Montreal General Hospital.

ment each year suffering from disabilities resulting from old fractures involving the ankle. Henderson, writing in 1932, reports that during the years 1925 to 1930, 122 such patients applied for treatment at the Mayo Clinic, while in that same period 82 fresh fractures of the ankle were dealt with. Such a comparatively recent report throws an interesting light on the present-day status of the treatment of these injuries and suggests that it may not be amiss to bring the subject up for discussion by describing a specific technique of handling them.

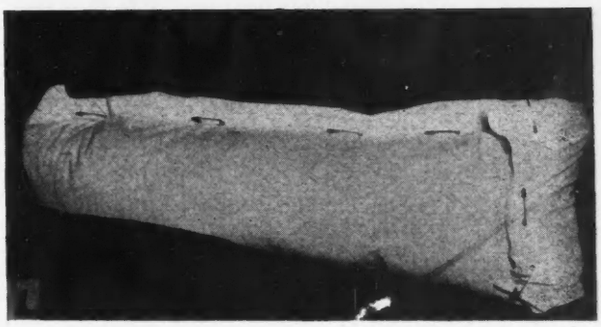
Everybody will agree that efficiency must be the basis of all methods of surgical treatment. The majority of surgeons will not deny that simplicity is probably the next most desirable attribute of any particular method. In this article, it is proposed to describe a method of treatment of fractures involving the ankle embodying these two principles. Special emphasis is laid on the method of anæsthesia, and the position of the patient during the reduction and application of the plaster of paris cast, and while the advisability of permitting early protected weight-bearing is urged, the unwary are warned against the disastrous effects of too early unprotected weight-bearing.

First-aid.—In fractures of this kind, as indeed in all fractures, the principle of "splint them where they lie" must be rigorously observed. The emergency form of traction embodying the Thomas splint with the bandage windlass fixed at the region of the ankle, which is so effective in most fractures of the lower extremity above the ankle, cannot successfully be applied here. Perhaps the best method of first-aid fixation of these fractures is that in which immobilization of the injured part is attained through the use of a pillow splint (Fig. 1).

Depending on whether the displacement is in the outward or inward direction, the foot, with the ankle dorsiflexed, is pulled in the opposite direction, with a twist of the open end of the pillow slip around the sole. The open end of the slip is then fastened on the inner or outer side of the ankle as the case may be. After a suitable dose of morphine has been given to ease the pain and allay the anxiety of the injured person, he is placed as soon as possible under the care of the surgeon.

Treatment.—In discussing the treatment of many fractures nowadays, one must consider open as well as closed reduction followed by immobilization with some form of internal or external fixation. It is probable that fractures involving the ankle joint, with few exceptions, notably so-called marginal fractures of the tibia involving more than one-fourth of the weight-bearing surface of the tibia, or cases showing wide separation of the medial malleolus, are best treated by closed reduction followed by external fixation with plaster of paris.

A marked characteristic of fractures into the ankle is swelling in the region of the joint. Compounding is a rare occurrence, though at times one does find blister formation or abrasions at the site of the injury. It is believed that injuries of this type are no exception to the general rule that fractures are best treated by achieving reduction in the shortest possible time compatible with freedom from shock. Furthermore, it is believed that the best way to deal with swelling is to reduce the fracture and correct the distortion of the part as soon as possible. The ideal is to reduce and immobilize the fracture before the swelling has had a chance to form, but few patients are seen early enough for this.



Anæsthesia.—In fractures involving the ankle, as in most forms of emergency trauma, regional anæsthesia has many important advantages. In these and certain other fractures of the lower extremities, the use of sciatic nerve block has been found to be of great value. The simplicity of the equipment necessary for its administration, as well as the absence of postoperative respiratory complications, gastric upset with possible aspiration of vomitus, and cardiovascular embarrassment in the aged, are all points in its favour. In the rare case of compound ankle fracture which requires debridement involving operating towards the medial aspect of the ankle in a region the skin sensibility of which is mediated by the long saphenous nerve, the sciatic block is combined with a subcutaneous field block around the medial hemi-

circumference of the leg just below the knee. This is only necessary in cases where the skin is broken. In closed fractures the unaided sciatic block will render insensible all the deep structures about the ankle joint.

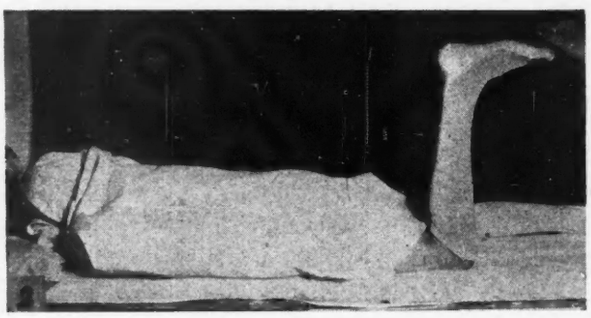
The preliminary medication, in the case of a young adult male, consists of morphine sulphate, gr. ¼, and nembutal, gr. 3, given half an hour before bringing the patient to the operating room. To patients over fifty years of age nembutal is not given, the morphine sulphate gr. 1/6 being adequate by itself.

The patient is placed prone on the operating table. The buttock and the whole lower extremity on the affected side are exposed, and the sciatic nerve is blocked after its emergence from the pelvis through the great sacro-sciatic foramen on to the gluteal region.

Reduction and immobilization. — Reduction and immobilization go hand in hand more in the case of these than most fractures because, due to the frequency of dislocation accompanying them, with resulting instability of the parts, the finishing touches can be put to the reduction only with the plaster of paris support in place and actually while it is in the process of hardening.

With the patient still lying prone on the table, the knee is now bent at right angles so that the leg is vertical, and is easily held in this position by an assistant supporting the region of the mid-leg with one hand. Thus, with the powerful gastrocnemius muscle fully relaxed, posterior displacement of the foot is easily corrected by pulling the foot forwards on the leg and then dorsi-flexing the ankle so that the foot is at right angles to the leg. In a case without posterior displacement, the ball of the foot is simply pressed downwards so as to bring the foot at right angles to the leg. The other hand of the assistant maintains this easy pressure downwards at the ball of the foot and the lateral or medial displacement is next corrected. Very little effort is required on the part of the assistant to maintain the limb in this position as opposed to the considerable strain imposed on the operator and assistant alike when the patient is lying, as is more usually seen, on his back. In fact, a co-operative patient will easily hold the leg in this position without outside support. Another advantage of this position is the fact that using the ordinary operating table, the foot and ankle are placed at a very convenient working point, at or somewhat above the level of the waist of the operator (Fig. 2).

The form the necessary manipulation to correct the lateral or medial displacement will take depends on the type of fracture or fracture-dislocation with which one is dealing. Experience has shown that the most successful method of reducing these fractures depends on the recognition from the history, clinical examination,



and especially the x-ray of the mechanism responsible for the fracture. The displaced parts are then made to retrace the steps they took in assuming their displaced position.

In those cases in which there is no displacement, no manipulation being necessary, as soon as the limb is free from swelling, after a period of from four to fourteen days in a pillow splint, it is put in a plaster of paris walking cast with the foot in the corrected position. For example, in a first degree lateral rotation injury without displacement, the foot is put up in strong medial rotation, being careful to avoid the common mistake of fixing the foot in inversion.

In cases with any degree of displacement of the foot or diastasis of the inferior tibio-fibular joint, manipulation is necessary. Once the mechanism of injury is recognized, reduction becomes a relatively simple matter.* Thus, lateral rotation is corrected by putting the foot into medial rotation, adduction by abduction, abduction by adduction, and backward displacement by forward replacement of the foot. Accordingly, for example, in a third degree abduction fracture-dislocation, the backward displacement is first corrected by pulling the foot forward and keeping it at right angles to the leg. The lateral displacement is next corrected by pushing the foot into strong adduction by pressing forcibly in a medial direction with the heel of the hand over the lateral malleolus and

* A practical classification is given a little further on. It is considered of great importance in the treatment of these fractures.

hindfoot just below the malleolus, being careful not to be misled by pressing on the forefoot and thus pushing the foot into inversion rather than adduction.

With the foot held in the corrected position by the assistant, the application of the plaster of paris cast is begun. An old silk stocking forms a suitable protection for the leg and foot underneath the plaster. In cases with no swelling a walking cast may be applied at once. More commonly a lighter cast not intended for walking is applied at first. The plaster extends from the level of the lower border of the patella to the tips of the toes on the plantar surface and to the webs of the toes on the dorsal surface of the foot. It is very easily applied with the patient in the prone position, the knee at ninety degrees flexion and the foot at right angles to the leg.

A so-called sugar-tongs or stirrup type of plaster mould is first built directly on the limb extending from the upper calf and passing over both malleoli and across the sole (Fig. 3). A posterior mould is next applied extending from the upper calf to the tips of the toes (Fig. 4). It is felt that the plaster moulds can be better fitted to the limb by being actually built on the limb itself than on a nearby table, and as will be seen, the prone position of the patient facilitates their application. In addition to strengthening the cast where it is most needed, they fill another very important function in preventing the too tight application of the outer spiral bandage as mentioned below.

No further plaster is then applied for the moment. The ankle is moulded firmly into the corrected position, and held there while the plaster hardens (Fig. 5). Widening of the joint mortice due to displacement of the fractured malleoli or diastasis of the inferior tibio-fibular joint is corrected by applying pressure with the heels of the hands from either side on the lateral and medial malleoli while the plaster hardens. During all this time the knee and ankle are kept flexed to ninety degrees by the assistant. As soon as the plaster as already applied has hardened, the cast is completed by the application of a straight spiral plaster of paris bandage, using two to four plaster bandages, depending upon whether a non-walking or walking cast is required. Finally the plaster is moulded firmly to achieve close apposition around the ankle and around the broad upper end of the tibia. It is to the upper end of the tibia around which the plaster fits snugly as the bucket of an artificial leg fits the amputation stump that the body weight is transferred via the flat heel.

We have found it unnecessary to use padding and have had no trouble from impairment of the circulation of the foot. We believe, moreover, that the use of voluminous padding in the plaster cast rather interferes with efficient reduction of the fracture-dislocation in that the parts cannot be easily palpated through the plaster, and, in any case, we are inclined to doubt the utility of padding in the prevention of circulatory impairment as the result of post-reduction swelling. It is probable that most of

the troubles that arise in this way are the result not of the application of unpadded plaster, but rather of the application of too tight encircling layers of plaster bandages causing constriction of the limb. If longitudinal plaster moulds are first placed on the limb as a foundation and if the encircling layers of plaster bandage are next laid on these, the danger of constriction will be largely eliminated. As an added safe-guard, the part is always kept elevated in the post-reduction period so as to lower the venous pressure and thus encourage the efficient removal of tissue fluid from the part.

AFTER-TREATMENT

After a period of ten to twenty days (during which weekly x-rays are taken), when the swelling has practically disappeared and union has progressed to such a point as to prevent easy recurrence of the displacement, the plaster cast is removed again with the patient lying prone on the operating table. It has been found much easier to remove a plaster cast covering the foot and leg by dividing it with the plaster shears along the mid-line of the calf behind over the soft mass of muscles found in this region than over the subcutaneous surface of the tibia in front. A plaster of paris walking cast is now applied. The walking cast is worn for a period of eight to ten weeks, depending on the age of the patient and the severity of the injury. It is then removed, and the position of the fragments and the progress of bony union determined both by clinical and roentgenological examination. In an occasional case with delayed union a new plaster of paris walking cast may need to be applied for a further period of four to six weeks. Usually, however, at this time bony union is well advanced and the foot and leg are encased in elastoplast or an Unna's paste bandage to prevent swelling of the leg and foot while the patient is allowed to wear boots and to walk with or without the aid of a stick. In a small percentage of cases, with severe injury, a further period of support with some form of brace such as a vertical rod and T-strap is indicated.

It is essential that the patient should be admitted to hospital for each change of plaster and before final unsupported weight-bearing is allowed. It is sometimes difficult to say how far union has advanced even after the lapse of many weeks and the behaviour of the injured limb should be carefully watched over a period of two to three days of unsupported weight-bearing before the patient is finally discharged walking on the unsupported limb. The importance of this is shown by the fact that the most frequent cause of disability, next to unsuccessful reduction, is too early unsupported weight-bearing.

According to Gurd, the period of disability depends on the nature of the injury and the occupation of the patient. The well-tried policy of early weight-bearing with plaster support of the limb has enabled patients to resume their normal activities often within three weeks of the injury in a large percentage of cases. It must be emphasized, however, that unsupported weight-bearing should never be allowed before eight weeks at least, more often ten weeks, and frequently twelve weeks have elapsed since the time of injury. At least three months and very often six months should elapse before work involving much use of the unsupported injured limb should be permitted.

CLASSIFICATION

It is remarkable what variation still exists in the classification of these injuries and the interpretation of their mechanisms in the different textbooks and treatises on the subject. The undeniable fact that some of these injuries come under no practical classification is no argument against the usefulness of a classification. It must also be admitted that classifying them has been one of the greatest aids to their understanding and treatment. The Ashhurst-Bromer classification, based on the mechanism of the injury seems to be the most complete and clinically useful one, but its very completeness makes it a little cumbersome for everyday use. The simplified classification which is given here is based on that of Ashhurst-Bromer and does not differ from it in any essential respect, particularly insofar as interpretation of the mechanism is concerned. It has been found useful as a guiding principle in practice.

According to Ashhurst, 95% of these fractures are due to one or other of these mechanisms, *viz.*: (1) Lateral rotation of the foot on the leg; (2) fibular flexion or abduction of the foot on the leg, and (3) tibial flexion or adduction of the foot on the leg.

It should be noted that fractures involving the ankle are not due to either inversion or eversion, both of which movements occur, not at the ankle joint, but at the midtarsal and

subastragaloid joints. Usually the only active movements that occur at the ankle joint are flexion and extension. With the ankle strongly plantar-flexed slight degrees of gliding movement, adduction, abduction, and medial and lateral rotation are permitted. The upper articular surface of the astragalus is wider in front than behind so that when the ankle is strongly dorsi-flexed, the malleoli have to move apart somewhat to accommodate the wider anterior portion of the astragalus. Such separation of the malleoli is permitted by the very slight movement possible at the inferior tibio-fibular syndesmosis, facilitated by a slight gliding movement at the superior tibio-fibular plane joint. When abduction, adduction, or lateral rotation of the foot on the leg or the corresponding movements of the leg on the foot are forced, fracture inevitably occurs. Probably the more usual cause of these fractures is abnormal forcing of the mortice formed by the tibia and fibula on the wedge formed by the astragalus with the foot fixed firmly on the ground; that is to say, forced movements of the leg on the foot. However, the mechanisms in the succeeding discussion will be described as movements of the foot on the leg.

It is admitted that the fracturing force in some instances may act through a combination of mechanisms. For example, a fracture-dislocation may be caused through a combination of lateral rotation and abduction of the foot to which may be added also upward thrust of the astragalus on the tibial supporting surface. The upward thrust, or vertically acting force, can be recognized by marginal fracture, or, in severe cases, by comminution of the tibial joint surface. The individual results of the combined horizontally acting forces of abduction and lateral rotation may not be capable of being differentiated but the important matter clinically is that one or other of these forces will predominate in most instances, giving a picture approximating to the type of fracture resulting from that particular force.

The radiological appearance of the fracture is more important than either the clinical picture, or the patient's story from the point of view of recognition of the fracture mechanism. Thus, a pre-reduction x-ray should be taken whenever possible. Its importance is barely exceeded by that of the post-reduction x-ray which should virtually never be omitted. The whole success of the treatment of these fractures depends on the attainment of accurate anatomical reposition of the upper surface of the astragalus in contact with the under surface of the tibia. The achievement of this can be proved only by seeing in the lateral view the concave line of the under surface of the tibia lying nicely opposed to, and concentric with, the convex line of the upper surface of the astragalus and similarly by seeing, in the antero-posterior view, the convex line of the tibial surface resting squarely on the concave line of the astragalus. If this result is not attained, the attempt at reduction must be repeated, success being usually met with at the second attempt. Too frequent attempts at reduction must be guarded against owing to the fact that acute post traumatic bone atrophy (Sudeck) may be caused in this way. If correct reduction is not secured, increasing recurrence of the subluxation and arthritis with painful disability will be the inevitable result.

Each type of fracture may be one of three degrees depending on the severity of the injury. It should be noted here that even in the severest type of third degree fracture involving the ankle, dislocation of the talus and hence of the foot, is not necessarily present. As soon as the injuring force ceases to act the parts tend to snap back into position again and may remain so. However, the important point to remember is that due to the bony and ligamentous injury, dislocation or subluxation is possible and will occur if the injuring force is allowed to continue to act, if the injured foot is stood or walked upon, or if careful emergency immobilization is not resorted to.

The following is a classification of the more common types of injury together with a brief description of a suggested mechanism of their causation:

A. FRACTURES DUE TO LATERAL ROTATION OF FOOT (FIG. 6)

1. *First degree injury:* fracture of fibula only.—Fracture due to twisting off by the talus of the lower end of the fibula. The fracture line is usually oblique from above and behind to down and in front, often passing through the inferior tibio-fibular joint. The obliquity of the fracture line of the fibula marks the injury at once as being due to forced rotation (twisting) rather than flexion (bending). There is little or no displacement of the foot; sometimes the break in the fibula occurs above the inferior tibio-fibular joint, often at the junction of the ultimate and penultimate fibular fifths.

2. *Second degree injury:* fracture of fibula, plus fracture of medial malleolus or rupture of medial ligament.—Fracture due to twisting off by the talus of the lower end of the fibula, as in the first degree injury, plus rubbing off by the talus of the medial malleolus at or below the level of the tibial supporting surface, or more rarely, twisting off by the talus of the lower end of the fibula plus rupture of the medial ligament.

In the second degree injury there is usually lateral and possibly posterior displacement of the foot, and this serves to differentiate the second degree injury in which fracture of the fibula is combined with rupture of the medial ligament from a first degree injury, in which there is little or no displacement.

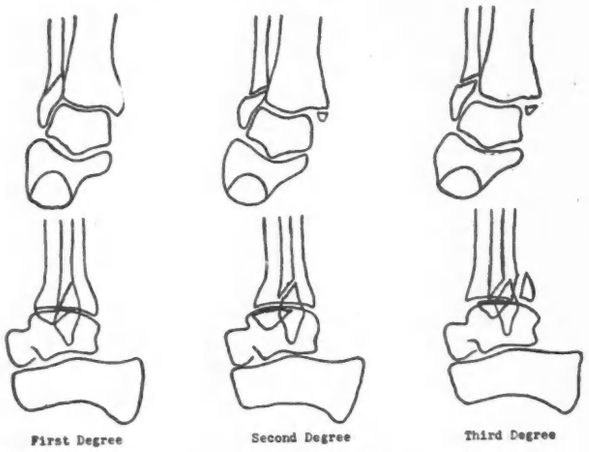


Fig. 6. LATERAL ROTATION INJURIES

3. *Third degree injury:* fracture of fibula plus fracture of medial malleolus or rupture of medial ligament, plus fracture of posterior tibial malleolus.—This injury is the same as in the second degree type plus pulling off of portion of the posterior tibial tuberosity (posterior malleolus of Destot) by the posterior inferior tibio-fibular ligament through the medium of the fractured lower end of the fibula. This posterior tibial fragment is sometimes a mere chip but often a larger portion involving the tibial supporting surface is split off by upthrust of the astragalus on the posterior part of this surface. In the third degree injury there is usually backward and lateral displacement of the foot.

In all three degrees of lateral rotation injury the fractures of the fibula may occur in its upper one-fourth, usually at the neck, instead of in its lower one-fourth, as described above.

B. Fractures Due to Abduction of the Foot (Fibular Flexion) (Fig. 7)

1. *First degree injury:* fracture of medial malleolus only.—Fracture by pulling off of the medial malleolus with a transverse fracture line usually below the level of the tibial supporting surface. As a rule there is no displacement of the foot.

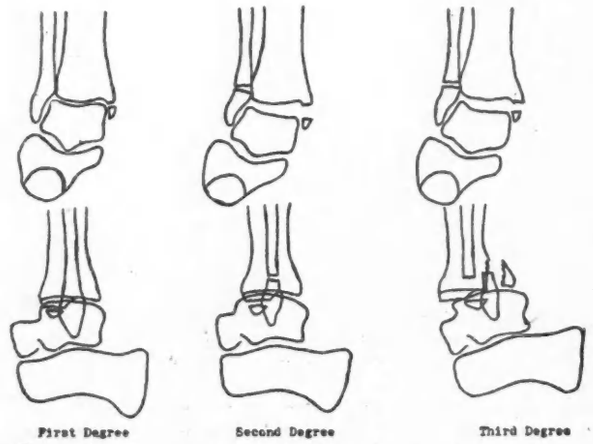


Fig. 7. ABDUCTION INJURIES

2. *Second degree injury:* fracture of medial malleolus or rupture of medial ligament, plus fracture of fibula.—Fracture by pulling off of the medial malleolus or more rarely rupture of the medial ligament followed by transverse breaking off of the lower end of the fibula either at, below, or more rarely (in the case of weak inferior tibio-fibular ligaments), above the inferior tibio-fibular joint, often at the junction of the ultimate and penultimate fifths of the fibula.

Displacement varies from none to marked lateral deviation of the foot with or without diastasis of the inferior tibio-fibular joint. Due to the breaking loose of the portion of fibula to which is attached the important posterior talo-fibular ligament, posterior dislocation of the foot on the leg may occur as a secondary displacement.

3. *Third degree injury:* fracture of medial malleolus, or rupture of medial ligament, plus fracture of fibula, plus fracture of posterior tibial malleolus.—This injury is the same as in the second degree type plus fracture of the posterior tibial malleolus by the same mechanism as in the third degree lateral rotation injury. There is usually lateral and posterior displacement of the foot. This is an unusual injury. In the second and third degree abduction fractures, as in the lateral rotation injury, the break in the fibula may occur in its upper one-fourth, usually at its neck, instead of in its lower one-fourth.

C. Fractures Due to Adduction of the Foot (Tibial Flexion) (Fig. 8)

1. *First degree injury:* fracture of lateral malleolus only.—Fracture by pulling off of the lateral malleolus transversely at or below the level of the tibial supporting surface. There is little or no displacement of the foot and the fracture is often subperiosteal.

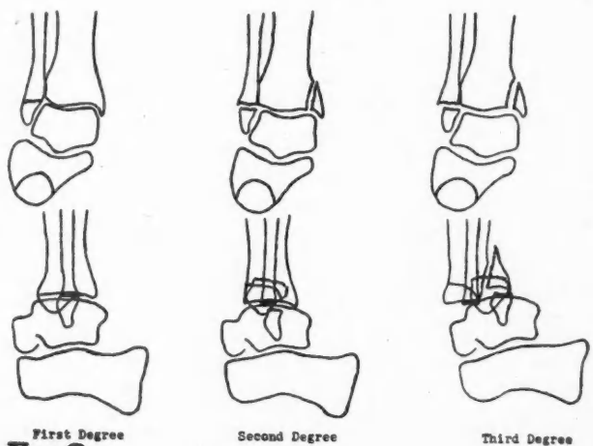


Fig. 8. ADDUCTION INJURIES

2. *Second degree injury:* fracture of lateral malleolus plus fracture of tibia.—Fracture by pulling off of the lateral malleolus as in the first degree type followed by breaking off of the medial malleolus and medial surface of the tibia up from the tibial supporting surface. The more or less vertical fracture line of the medial malleolus is characteristic of the adduction injury. Medial displacement of the foot occurs, together with any amount of posterior displacement. Posterior dislocation of the foot occurs as a secondary displacement as in the second degree abduction injury.

3. *Third degree injury.*—The injury is the same as in the second degree type plus fracture of posterior tibial malleolus. In adduction injuries fracture of the posterior malleolus is not often seen. When it does occur, it is probably due to upward thrust by the talus on the posterior part of the tibial supporting surface and not to the lateral pull of the posterior inferior tibio-fibular ligament which does not occur in this injury as it does in the lateral rotation and abduction mechanisms.

D. FRACTURES DUE TO UPWARD THRUST OF FOOT ON THE TIBIAL SUPPORTING SURFACE

1. Isolated fractures of the tibia up from and involving the supporting surface at its posterior, anterior, medial, or even its lateral margin.
2. Comminution of the tibial supporting surface and T-fractures or Y-fractures of the tibia into the ankle joint.

E. SUPRA-MALLEOLAR FRACTURES (OCCURRING WITHIN FOUR CENTIMETRES OF THE ANKLE JOINT LEVEL—ASHHURST)

These may be due to direct or indirect violence and may be the result of lateral rotation, abduction, or adduction mechanisms. This group includes cases of separation of the lower epiphysis of the tibia. (See schematic drawings.)

Fractures included in groups D and E are not common, subject to wide variation, and their treatment will not be discussed. It will be seen that the first two divisions (A and B) include the fractures involving the stability or equilibrium of the foot while the last three divisions (C, D, and E) deal with the fractures injuring the tibial supporting surface and thus interfering with the function of support.

In Ashhurst's group, fractures by lateral rotation comprised 61% of the whole; fractures by abduction comprised 21% of the whole; and fractures by adduction comprised 13% of the whole.

The remaining 5% are made up by the upward thrust injuries and fractures by direct violence.

SUMMARY

A method is described for the treatment of fractures involving the ankle in which the advantages of regional anæsthesia, prone posture of the patient during the reduction and plaster fixation, and early protected weight-bearing are emphasized.

I should like to express my indebtedness to Dr. Fraser B. Gurd for much advice in the preparation of this paper. The views expressed are largely based on his conception of the causation and treatment of ankle fractures.

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THE VALUE OF LUMBAR SYMPATHETIC PROCAINE BLOCK*

By Josephus C. Luke, M.D., F.R.C.S.(Eng.) and [C.]

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PROCAINE block of the lumbar sympathetic chain has been advocated in the diagnosis and treatment of many conditions involving the lower extremities since Leriche[1] first described the therapeutic use of this procedure. However, it is only in recent years that this test has received its proper emphasis and become an exact method of diagnosis and treatment. Consequently we consider it would be appropriate to review and correlate the various conditions where this type of nerve block is used, and to mention the common errors in the interpretation of this test.

As indicated above, procaine block of the lumbar sympathetic chain is useful in two main groups of cases: as an aid in the diagnostic assessment of a patient, and as a therapeutic procedure.

In the investigation of: (*a*) Obliterative arterial diseases: *e.g.*, Buerger's, arteriosclerosis, old arterial thromboses of various origins. (*b*) Vasospastic diseases: Raynaud's phenomenon, acrocyanosis, livedo reticularis, pernio, some post-poliomyelitis cases and those of undetermined origin. (*c*) Hyperhidrosis.

In the treatment of: (*a*) Causalgic states following trauma with or without post-traumatic osteoporosis. (*b*) In acute arterial emboli and acute arterial thrombosis. (*c*) Traumatic arterial damage. (*d*) The associated arterial and venous spasm occurring in some cases of acute thrombophlebitis.

ARTERIAL OBLITERATIVE DISEASES

As is well known, investigation of this type of case seeks to determine the exact diagnosis, and also to find out the degree of uninvolved arterial supply capable of dilatation and so capable of increasing the arterial inflow to the limb. This information is obtained by determination of the increase (or not) of skin temperatures following the release of sympathetic vasoconstrictor tone to the vessels. The easiest method of application, and one which

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has therefore gained almost universal application, is that of reflex vasodilatation, where the hands and arms are immersed in water of 45° C. or the skin of the trunk is heated by an electric baker. Skin temperature readings are taken from the feet before and at intervals afterward. The mechanism of this test is apparently that the warm surface blood affects the heat-regulating centre in the mid-brain resulting in a generalized vasodilatation. Unfortunately, in the majority of cases, sweating also occurs which falsifies skin readings by cooling caused by the evaporation of the perspiration. A good example of this is seen in Fig. 1 where, if the readings following reflex vasodilatation had been accepted without question they would have deprived the patient of a very beneficial sympathectomy, the preliminary effect of which was indicated by the more exact lumbar sympathetic block.

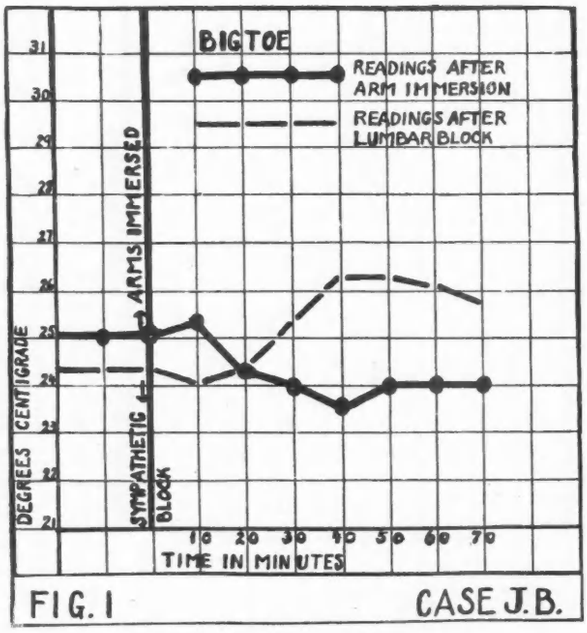


FIG. 1 CASE J.B.

Other methods such as spinal anæsthesia are also open to error inasmuch as a spinal to be effective in paralyzing the sympathetic outflow to the legs must give anæsthesia as high as the 7th or 8th dorsal segment. A spinal to that level usually gives a drop in blood pressure unless ephedrine is given. A fall in blood pressure will give lower skin readings from decreased blood flow to the limb, while the patient under a spinal anæsthetic who has received ephedrine to maintain blood pressure will show false readings because of the direct vasoconstrictor action of the drug on the smooth muscle of the vessels.

The only true representation of the sympathetic denervation of the extremity is the lumbar sympathetic procaine block or block of the peripheral nerves about the ankle. No systemic effects are involved and the untreated other extremity is there for comparison. The test can more thoroughly be appreciated by the patient who sees and feels the improvement in circulation in comparison with his opposite foot. He can also get up and walk while the effect of the block is still in progress, and so appreciate the improvement in his claudication pains. When a sympathectomy is indicated, the rationale is perceived by the patient with very little explanation.

Vasospastic Diseases

A definite case of Raynaud's disease where an attack has been observed in progress needs little investigation for diagnosis, but in the conditions of livedo reticularis and acrocyanosis the degree of improvement following sympathectomy, if such an operation is contemplated, can be observed and demonstrated to the patient. The same applies to group (C) where in the occasional case the excess sweating is severe enough to need correction.

In all the above uses of lumbar sympathetic block the improvement in limb circulation has been demonstrated by increases in the distal skin temperatures.

The palpating hand is an excellent thermometer but not sufficiently exact; the best method of recording skin temperature changes is by some mechanical means such as the Taylor dermatherm or McKesson dermalor. The taking of these readings demands a certain technique. The legs must be exposed for at least 20 minutes before the pre-block readings are taken to come into equilibrium with the environmental temperature. The room must be free of air currents and of a constant temperature. In the ordinary steam heated room with a closed door it is surprising what fluctuations of temperature take place, and the accuracy of the results thereby suffers. A specially constructed constant temperature room is the ideal. This changing environmental effect on the skin temperature is important because a true improvement of 1° C. or over, subsequent to lumbar block, indicates that there will be definite clinical improvement by sympathectomy, and changes as little as this can easily be missed by improper technique.

Skin temperatures are not the ideal in the estimation of improvement of blood flow to the part and recently it has been questioned by Friedlander[2] and Cohen[3] whether this is a true representation of what takes place in the entire limb. They state that sympathectomy apparently only improves skin circulation and not that of muscle because of the lack of corresponding rise in muscle temperature. However in recent clinical investigations by Dr. K. A. Evelyn and the author[4] we have shown that sympathectomized muscle, in response to a locally applied cold stimulus on the adjacent skin, cools more slowly and returns to normal more rapidly than does a corresponding non-sympathectomized one. This was in cases of Buerger's disease where the degree of involvement was practically equal in both legs. After sympathectomy of the previous control leg, the muscle in both legs now showed this resistance to cooling, a fairly convincing proof that this resistance was the result of improved muscle blood supply.

CAUSALGIC STATES

In a small proportion of cases of trauma to the lower extremity, even though slight, the patient is left with unexplained, frequently severe, paroxysmal burning pain in the area: which in the more marked cases gradually extends up the limb and later becomes associated with a progressive osseous decalcification. Many names have been given to this condition, the most commonly used being post traumatic painful osteoporosis and Sudeck's atrophy. According to de Takats[5] this is due to an imbalance of the ordinary nervous reflexes set up by injury, with a preponderance of parasympathetic action and an excess local secretion of the pain-producing vaso-dilating choline-like substances. The clinical findings correspond to this conception, with some increase in sweating, increased warmth, increased oscillometric readings and more readily palpable pulses. In these cases, a lumbar sympathetic procaine block gives immediate relief of pain to the majority and this effect is prolonged long after the normal length of time one would expect such a block to have an effect. De Takats suggests this result is achieved by the reduction in the increased capillary resistance present with washing out of the pain-producing choline substances, plus the longer effect on the non-myelinated sympathetic fibres by the procaine. Repeated lumbar blocks may permanently relieve the pain but, if return of symptoms occurs after three temporarily successful blocks, then sympathectomy is indicated.

Another variety of causalgia which is frequently benefited by lumbar block is that following trauma to one of the major nerves to the limb. This was more frequently seen after World War I than during the recent conflict, although many recent large series were published in the German literature. In such cases where no evident nerve interruption is present, yet hyperesthesia, pain and evident vasomotor imbalance exist, cure frequently follows one or more blocks, or if relief from these is only temporary, then sympathectomy will give a permanent result.

ARTERIAL EMBOLISM

It is now well known that when an embolus lodges in a peripheral artery there is not only blockage of this main vessel but also the ischæmia is increased by a state of spasm initiated by the catastrophe, which involves all the vessels of the limb. Thus the collateral circulation is inhibited in its attempt to take over the circulation interrupted in the main vessel. The combination of a blocked main vessel plus continued spasm of the collateral system almost invariably leads to a gangrenous distal limb of varying degree; consequently it is of greatest importance to relieve this element of spasm before determining whether embolectomy is necessary.

A suggested outline of treatment in an early case of peripheral embolism is as follows: intravenous papaverine gr. ½ when first seen, rapid hospitalization and immediate lumbar sympathetic procaine block; if colour and warmth return to the foot then embolectomy is unnecessary; if little or no improvement results then embolectomy is proceeded with. Anticoagulants, using both heparin and dicoumarol should be employed immediately if operation (embolectomy) is unnecessary, or shortly after operation if embolectomy is performed to prevent extension of the thrombus in the case not operated upon, or new thrombosis in the artery of the patient who has had an embolectomy. The heparin can be discontinued in 36 to 48 hours when the effect of the dicoumarol takes over.

Traumatic Arterial Damage

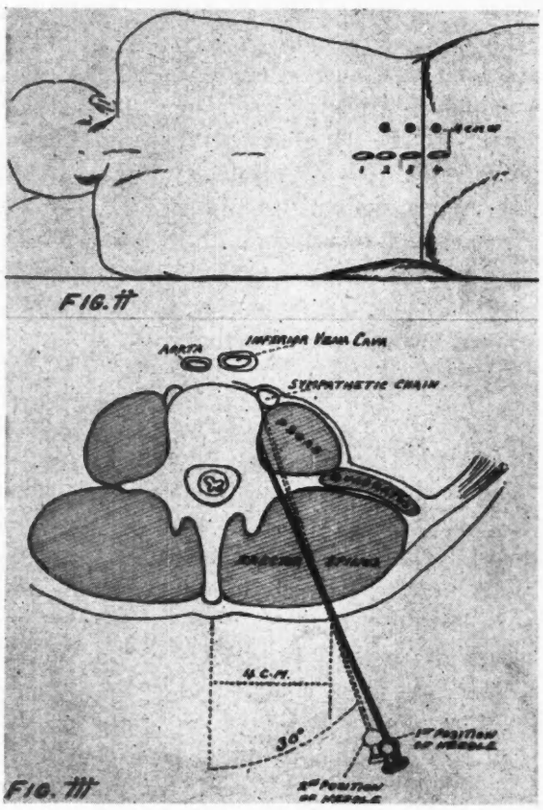
In World War II those of us engaged in forward surgery were forcibly impressed by the large number of cases of wounds involving major limb vessels which were followed by distal gangrene. Various procedures, including different types of tubes, were tried in attempts to better this state of affairs but little improvement in the incidence of gangrene resulted. One of the procedures advocated was lumbar sympathetic block, and this was carried out postoperatively almost daily in those cases of major vessel interruption. I have no statistics to offer as evidence, but the unfortunate outcome seemed to be seldom affected by the block. This failure cannot however be wholly laid at the door of the lumbar block as there were so many other factors in these cases. The two main ones were firstly, the associated extensive wounding with a considerable proportion of the collateral circulation also knocked out, and secondly, extension of thrombosis distally from the point of ligation sealing off potentially effective collaterals connecting with the main vessel below its site of interruption. Toward the end of the war, with this latter factor in mind, we adopted the policy of heparinizing postoperatively all cases were arterial ligation or suture was done. As the flow of casualties ceased shortly thereafter, only five cases were so treated, but no instance of gangrene occurred.

Acute Thrombophlebitis

The treatment of this condition by procaine block of the lumbar sympathetic chain is not new,[1] the basis being that the inflammation of the deep veins results in varying degrees of spasm of the remaining venous and at times the arterial system. This latter can vary from the majority of undetectable degree, to the rare case where the spasm is so severe as to simulate an acute arterial occlusion. Lumbar block relieves the spasm temporarily and so usually needs repetition. Maximal blood flow to the limb occurs, aiding in resolution of the process and lessening the œdema. At the present time, due to the introduction of penicillin and dicoumarol, we have reserved lumbar block in the treatment of acute thrombophlebitis to those cases where clinical evidence of vasoconstriction can be demonstrated.

Technique

The position of the patient is the same as for lumbar puncture, lying on the edge of the table or bed with a straight back and flexed hips and knees (Fig. 2). The side to be done is uppermost. The spinous processes of L 2 and 3 are identified and marks made on the skin over the extent of their tips. A point 4 cm. lateral and opposite to the upper limit of the spines is selected and skin wheals made. Using a 4 inch 20 gauge lumbar puncture needle and inserting



it perpendicular to the skin the corresponding transverse process should be reached at a distance of 3 to 5 cm. depending on the obesity of the patient. If no bony resistance is felt at this level, the needle direction should be changed either cephalad or caudally until found. The needle course is then changed so as to pass over the upper border of the transverse process and angled toward the vertebral body which should be reached in another 2.5 to 3 cm. (Fig. 3). The needle is redirected so that the tip successively passes along the side of the vertebra to a site where the most anterior vertebral bony resistance is felt. The stylet is now removed and aspiration performed to exclude the accident of entering the subarachnoid space or a blood

vessel. If dry, 20 c.c. of 1% procaine is injected in each site. The fluid should run in without undue pressure, because, if force is needed, it indicates that the needle tip is probably in the anterior vertebral ligament and therefore should be withdrawn a fraction of a centimetre.

The effect desired will be manifest in 5 to 25 minutes depending on the accuracy of the needle placement in relation to the sympathetic chain, and reveals itself as a successful block by complete loss of sweating to the foot, increased redness and heat. The degree of the latter two, however, will depend on the degree of arterial occlusion present. The procedure has the drawback of being at times quite painful due to the fact that the periosteum of the transverse process and the vertebral body cannot be properly anæsthetized, and also the occasional instance where an issuing spinal nerve is hit. However as the spinal nerves run on the plane of mid way between the transverse processes, they can be avoided if the proper technique of passing just over each transverse process is followed. No after effects beyond the temporary soreness of the needle tracts have been seen in our cases.

SUMMARY

1. The indications for the use of lumbar sympathetic procaine block are enumerated.

2. We have found this procedure superior to all others in the investigation of the degree of remaining arterial potential in cases of obliterative arterial disease and in demonstrating the effect of sympathectomy in any peripheral vascular disease.

3. Lumbar block is a major part of the treatment of post-traumatic causalgias and arterial embolism, and is useful in certain cases of acute femoro-iliac thrombophlebitis.

4. The technique is described.

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RÉSUMÉ

Le blocage lombaire par la procaine est indiqué dans le diagnostic des affections oblitérantes des artères, dans les maladies vasculaires caractérisées par du vasospasme et de l'hyperhydrose; dans le traitement des causalgies, dans les embolies et les thromboses artérielles aigues, dans les dégâts artériels d'origine traumatique et dans certains cas de thrombophlébites aigues avec spasme artériel et veineux. Ce test est supérieur à tout autre pour évaluer le fonctionnement artériel dans les états où l'oblitération du vaisseau est soupçonnée et aussi pour vérifier les effets de la sympathectomie dans les maladies vasculaires périphériques. La technique, relativement simple, est décrite.

JEAN SAUCIER

THE EFFECT OF LOW PROTEIN DIET ON THE STRUCTURE OF THE PANCREAS*

(Preliminary Report)

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DURING the past two decades extensive and valuable information has been gathered concerning several types of fat deposition in the liver.[1] It has been shown that, in certain animals, these fatty changes may lead to serious cirrhotic processes which are similar to those found in certain types of human cirrhosis.[2]

In 1924, Fisher[3] and independently Allan, Bowie, Macleod and Robinson[4] reported the occurrence of fatty livers in depancreatized dogs maintained with insulin. This was at first regarded as a consequence of the loss of the digestive enzymes from the acinar tissue of the pancreas, but Hershey[5] hypothesized that a failure in the fat transport mechanism might be responsible. As proof, he reported that feeding lecithin was just as effective in preventing fatty livers in depancreatized dogs as was raw pancreas. Shortly thereafter, choline was shown to be as effective as lecithin.[6]

Best, Hershey and Huntsman,[6] pursuing this study, were able to produce fatty livers in the intact rat by the simple expedient of feeding a high fat-low protein diet. This condition, here produced in an entirely different manner, likewise responded to choline.[7] Studies with tracers subsequently showed that choline entered into and stimulated phospholipid activity in the liver of the fat-fed rat.[8]

It might have been assumed from this that raw pancreas prevented fatty livers in the depancreatized dog by virtue of its choline con-

* This work was carried on with the financial aid of the Blanche Hutchinson Fund of McGill University.

tent, but there is evidence that pancreas contains active factors other than choline.[9] It would thus seem that the fatty liver which occurs after pancreatectomy is distinct from that induced by a high fat-low protein diet. It has not been completely proved, however, that the dietary type of fatty liver arises independently of the pancreas.

EXPERIMENTAL

Since it seemed possible that the dietary fatty liver might be correlated with that which follows pancreatectomy, experiments were performed to observe the condition of the pancreas in animals maintained on a high fat-low protein diet.

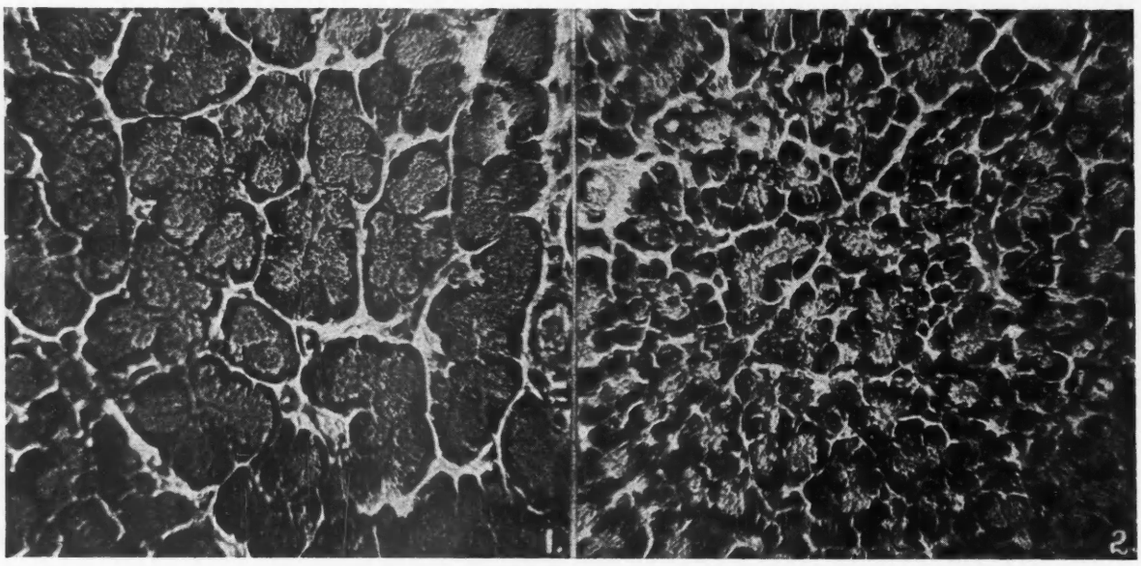

Fig. 1. — Normal control. Fig. 2. — Protein deprived. Appearance of the pancreas in rats maintained for 50 days, and fasted 24 hours terminally.

Three separate experiments were carried out, the first two of 21 days' duration, the third lasting 50 days. Male albino rats weighing 150 to 200 grams were used in groups of 12. In each experiment the first or control group received a normal, fully balanced diet, while the second received a diet containing increased amounts of fat (25%) and decreased amounts of protein (10%). The normal diet consisted of 25% protein as casein, 10% fat as crisco, 60% carbohydrate as cane sugar and 4% of a salt mixture (U.S.P. XII, No. 2). A supplementary vitamin B solution was given to all animals in the water, in amounts sufficient to give each rat a minimum of 25 γ thiamin, 40 γ riboflavin, 21 γ pyridoxine hydrochloride, and 100 γ calcium pantothenate per day. Cod liver oil, as a concentrate, was administered subcutaneously each day. Food intake was recorded daily throughout the experiment to ensure that the planned diets were yielding the correct amounts of test food.

Histological comparison at the end of the experimental period showed degenerative changes in the acinar tissue of the pancreas in those animals kept on high fat-low protein diets, as compared with the controls. These changes consist of loss of cytoplasm and squaring of individual acinar cells. The cytoplasmic loss proceeds until only a thin rim remains about a vesicular nucleus. Separation of the acinar cells then occurs, leaving the gland parenchyma filled with separate cells having little organized relation to one another. Stages of this process are observed side by side. These changes were more marked in the pancreas of animals maintained on the test diet for 50 days, and in all cases, went parallel with fatty infiltration and degeneration of the liver.

While it cannot be stated yet with certainty that this pancreatic change is specific, the suggestion arises that it may be correlated with the fatty infiltration and cirrhosis of the liver which follows high fat-low protein diets.

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INFECTIOUS MONONUCLEOSIS

By Surg.-Lieut. C. T. Collins-Williams, R.C.N.V.R. and Surg.-Lieut. C. C. Ferguson, R.C.N.V.R.

THIS article is a study of 67 sporadic cases of infectious mononucleosis treated at the R.C.N. Hospital at Halifax in the three and a half year period ending in June, 1945. All of the patients were naval personnel.

Infectious mononucleosis is a disease characterized by marked variations in its clinical picture but generally may be defined as a mildly contagious disease usually accompanied by fever, headache, general malaise and lymphadenopathy, and sometimes a palpable spleen. The blood picture shows a marked lymphocytosis and typically has many large mononuclear cells with large foamy nuclei and a vacuolated cytoplasm. Toward the end of the disease, the patient's blood usually develops antibodies which will agglutinate sheep erythrocytes on high dilution.

The diagnosis may be made on three points (1) the clinical picture (2) the blood examination and (3) the Paul Bunnell or heterophile antibody test. In this series, the diagnosis was not accepted unless two of these were positive.

The age incidence in our series is not significant because of the limited age group of the young men and women in the Navy. However, the majority of all cases occurred in the group between 20 and 25 years. The sex incidence again means little due to the much greater number of males serving in the Navy. However, of the 67 cases 6 were females serving in the W.R.C.N.S.

The largest number of cases occurred in the spring and fall of the year and the least number in the summer. The figures are as follows: fall, 24 cases; winter, 15; spring, 20; summer, 8.

Symptoms.—The clinical picture is complex and the symptomatology as shown in Table I diversified.

Table I shows the number of cases in which the various symptoms were present. It is of interest to note that of the 67 cases, 9 showed some evidence of bleeding from the nose, gums, throat or rectum. Occasionally, patients complained of fainting, vomiting and pruritus.

Initial diagnoses considered. — Due to the varied picture of the disease, many of the cases were not diagnosed correctly, when first seen. Table II shows the frequency of different diagnoses made on admission.

TABLE I.

Symptoms	*Cases*	*% of total*
Total number of cases	67	
Sore throat and/or headcold	55	82
Swollen lymph nodes	46	70
Malaise and weakness	46	70
Fever	33	50
Headache	28	42
Chills	15	22
Cough	15	22
Muscular pains	12	18
Anorexia	9	13
Rash	9	13
Stiff neck	8	12
Epistaxis	6	9
Loss of weight	5	7
Dizziness	4	6
Nausea	4	6
Pain or tight feeling in chest	3	4

From this it is apparent that the true condition was diagnosed on admission in just over one-third of the cases and that by far the most frequent diagnosis initially made was disease of the upper respiratory tract. This is explained by the frequency of normal leucocyte counts early in the disease and emphasizes the necessity of repeated blood studies in cases of upper respiratory infection that do not run the usual course but continue with unexplained symptoms, particularly low-grade fever. In fact, in this age group, infectious mononucleosis frequently provides the explanation for an unexplained fever.

TABLE II.

Initial diagnosis	*Cases*	*% of total*
Total number of cases	67	
Infectious mononucleosis	24	36
Tonsillitis	16	24
Upper respiratory infection	9	13
No diagnosis	7	10
Vincent's angina	5	7
Pharyngitis	3	4
Influenza	2	3
Mumps	1	1
Undulant fever	1	1
Retropharyngeal abscess	1	1
Tracheitis	1	1
Pneumonitis	1	1
Rheumatic fever	1	1
Scarlet fever	1	1
Meningitis	1	1
Non-specific parotitis	1	1
Lymphatic leukæmia	1	1
Bronchitis	1	1
Diphtheria	1	1

Physical findings. — The physical findings varied greatly. However, practically all the cases showed lymphadenopathy and inflamed throats. Twenty of the 67 cases had a palpable

spleen. The frequency of various physical findings is listed in Table III.

The lymphadenopathy was moderate in most cases although the size of the nodes in five cases was noted as being very large—over 3 centimeters in size. Most of the nodes were slightly tender and in 6 cases were noted to be remarkably tender.

The spleens varied from those palpable at the costal margin to those extending three fingers below.

There was nothing typical about the rashes. They were described as a fine blue mottling of the abdomen and chest; a blush on the chest; morbilliform; purpuric; erythematous over the whole body; small red papules on the chest; and red blotches on the face.

Two of the 5 cases of lung involvement were confirmed as pneumonitis by x-ray but resolved readily and led to no complications.

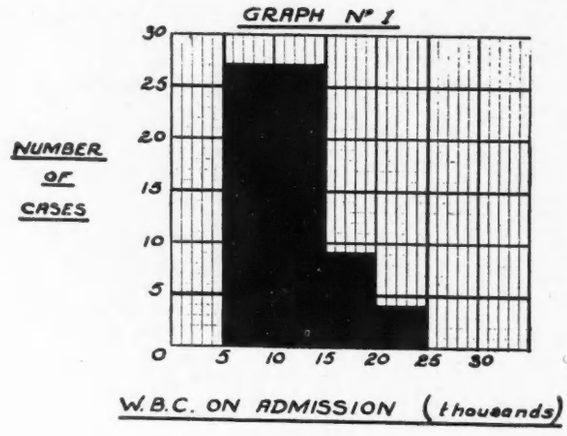
Three cases showed clinical jaundice and 2 others showed a latent jaundice (diagnosed by urinalysis and serum bilirubin estimations) but sufficient investigation was not carried out to justify conclusions as to the type of jaundice.

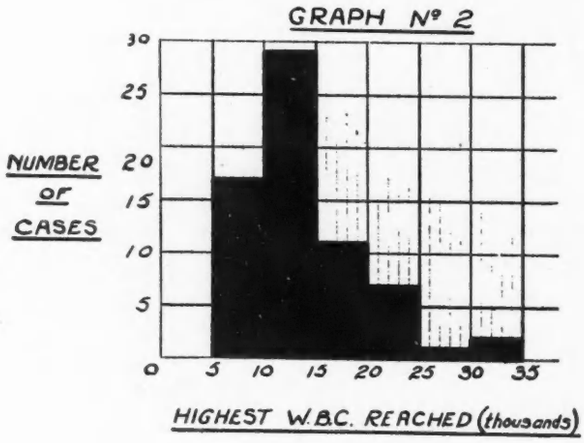
TABLE III.

Physical findings	*Cases*
Total number of cases	67
Lymphadenopathy—Cervical	57
Axillary	38
Inguinal	27
Epitrochlear	13
Mediastinal (by x-ray)	1
Inflamed throat	48
Rhinitis	24
Palpable spleen	20
Rash	9
Lung involvement—clinically	5
Jaundice	3
Palpable liver	1
Conjunctivitis	1
Stiffness of the neck	1

History of contact.—Although the patients in this series were not isolated in the hospital, no cross infection occurred. In only one instance was there a history of exposure preceding the attack.

The blood picture.—With few exceptions the white blood cell count on admission showed little variation from normal. The counts varied from 5,100 to 22,800, per c.mm. With repeated white blood counts, the total usually increased slightly, as is shown in Graph 2 for comparison with Graph 1. The highest count obtained in the series of cases was 33,700.

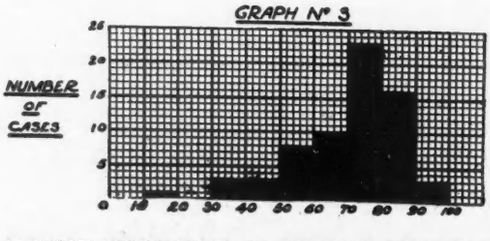




In many cases it was the differential count which first led to the correct diagnosis. In only 13 of the 67 cases on admission, was the percentage of the mononuclear series of cells (large lymphocytes, small lymphocytes, and monocytes) below 50% of the differential count. Most of these later showed a greatly increased percentage of mononuclear cells. In one case the highest percentage was as low as 18% but repeated positive Paul Bunnell tests and the clinical picture established the diagnosis.

The highest percentage of mononuclear cells reached during the course of the disease is shown in Graph 3.

The blood smear was characteristic of infectious mononucleosis in 34 of the cases and suggestive in 3 others; the criteria being many white



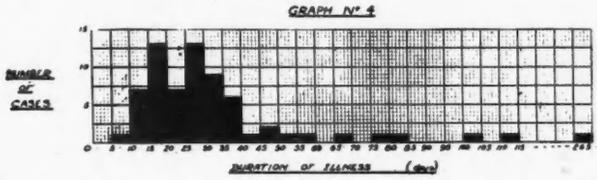
blood cells larger than usual with relatively large foamy nuclei containing a coarse meshwork of chromatin fibrils. Vacuolated cytoplasm and rounded oval, or indented nuclei were considered significant.

The sedimentation rate.—This showed in most cases a moderate but in no cases a marked elevation. It was found impossible however, to say whether the elevation was due to the disease or to the associated nasopharyngitis, upper respiratory infection, etc.

Serological findings.—Of the 67 cases, 49 were found to react positively to the Paul Bunnell test. Titres found in the Paul Bunnell tests varied from as low as 1 in 60 to as high as 1 in 5,120, with most of reactions being reported positive in the dilution range of from 1 in 160 to 1 in 1,280. There was no evidence that the Paul Bunnell test became positive or that the typical blood picture appeared more rapidly in the acute than in the chronic cases.

In 53 cases the Mazzini reaction for syphilis was done. One true positive, one temporary positive, and one doubtful reaction were found, the remaining 50 cases were negative.

Course of the disease.—Half of the cases had an acute onset usually marked by chills, headache, and sore throats, while the others had a



more insidious onset. Clinically, the severity of the disease ranged from the dangerously ill patient to the symptomless with low-grade fever.

Fever.—Only 8 of the 67 cases were afebrile while the largest number of cases had a peak fever of 102 to 103 degrees. There were all variations from afebrile up to 105 degrees. In most cases the fever lasted about 10 days but in one case continued for 70 days.

Duration of the illness.—In the majority of cases the illness lasted for about 30 days from onset of symptoms to discharge from hospital, but in a few instances, although there was little evidence of the disease, the patient continued to feel weak and fatigued for long periods of time, in one case for 265 days (Graph 4). In addition, many required convalescent leave. There was no evidence that the severe cases cleared up more quickly than the low-grade.

(The authors are grateful for constructive criticism of this article by Surgeon-Commanders J. W. Macleod, A. Ross, and D. H. Starkey, and by Surgeon-Lieutenant R. M. MacDonald.)

RÉSUMÉ

67 cas de mononucléose infectieuse sont rapportés. Cette affection sporadique peut être diagnostiquée par le tableau clinique (splénomégalie, adénopathies), l'hémogramme et la réaction de Bunnell. Le diagnostic peut être hésitant au début et il faut que l'examen clinique soit confirmé soit par l'hémogramme, soit par la réaction de Bunnell, ou mieux, par les deux. La maladie est peu contagieuse. Les monocytes varient de 5,100 à 22,800 par mm.c. Le sérum de ces malades agglutine les hématies de brebis même très diluées. L'hyperthermie est variable. La durée moyenne de la maladie est de 30 jours. JEAN SAUCIER

TREATMENT OF CYSTINE CALCULI*

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CYSTINE is a sulphur-containing amino acid present in protein foods of our normal diet. Cystinuria is a condition in which cystine in detectable amounts is found in the urine, and is regarded as being a rare, incurable, metabolic defect. Normal urine contains a few milligrams of cystine per litre.

The level of cystine excretion in the cystinuric patient is fairly constant, but is raised by a high protein diet independent of the sulphur content of the proteins eaten. In well marked cases as much as ½ to 1 gm. of cystine per day may be excreted in the urine. Although part of this cystine is considered to be endogenous in origin, there is reason to believe that it is mainly exogenous and derived from dietary methionine (the two sulphur containing amino acids are cystine and methionine). This view is held by Brand and his co-workers, and by Lewis, Brown and White. Randall and Andrews believe that the origin of cystine is endogenous, and that the cystinuric patient can oxidize to inorganic sulphate, cystine ingested by mouth as well as a normal person.

Cystinuria is reported as appearing to be more frequent in Jewish people. In our eight cases one patient was a Hebrew. Cystinuria

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has a definite hereditary and familial tendency, although not all members of a cystinuric family exhibit cystinuria (as shown by Andrews and Brooks in their study of a cystinuric family). Of those that do, not all form stones, although the potentiality always exists, depending on the amount of cystine excreted.

As this condition is more common than generally supposed, greater consideration should be given to the possibility of cystine composition of calculi in the urinary tract.

Cystine stones are the best example of a type of stone due to derangement of intermediary metabolism. They are found in acid urine, are oval, smooth, polished, and of a chalky-white or light yellowish or buff colour; have a soapy appearance and can be readily sectioned, cutting like a hard soap, and feel slightly greasy. Cystine stones, as a rule, contain only traces of other substances which for ordinary purposes need not be further identified. For all practical purposes the stones can be considered pure cystine.

It is reported by Andrews and Brooks that no clinical cases could be found in which a cystinuric has formed a calculus of any other composition than practically pure cystine. Our experience has agreed with this. This fact is of great importance in the treatment of calculus in the cystinuric patient.

However, it has been noted in an experiment on a dog in which the urine was infected with urea-splitting organisms, that a stone was found with cystine as a nucleus and a distinct outer coating of phosphate, *i.e.*, cystine was formed in acid urine and the outer layers laid down in the infected alkaline urine. We feel that in all cases of urinary stones it would be of value to hemisection the stone and examine the nucleus as well as the outer layers.

Cystine stones frequently form typical staghorn calculi and are often bilateral. They have been reported as being less likely to be associated with infection than other forms of calculi. This has not been borne out in our series of cases in which only one of the eight had uninfected urine.

DIAGNOSIS

1. By microscopic examination of urinary sediment. The presence of characteristic flat hexagonal crystals of cystine may be established. The urine should be made acid and should be concentrated. The first morning specimen is the best.

2. Cyanide-nitroprusside test of Brand, Harris and Biloon. This is accurate and is easily and readily done. Any voided specimen of urine may be used. It does not necessarily have to be a fresh specimen. The first morning specimen is probably the best single specimen to test. The 24-hour specimen of urine may be used if the test is not strongly positive: 3 c.c. of urine are mixed with 3 c.c. of 5% sodium cyanide; wait 3 to 5 minutes and then add a few drops of 10% sodium nitroprusside. Positive test gives a magenta, purplish, or permanganate colour which fades within a few minutes on standing.

To test the calculus.—A pinch of powder is boiled with 2 to 3 c.c. of water then treated with an equal amount of 5% sodium cyanide. After 5 minutes a few drops of sodium nitroprusside solution are added. The presence of cystine is indicated by a beautiful magenta colour (Brand).

TREATMENT

Klemperer and Jacobi (in 1914) were the first to advise alkaline treatment for cystinuria. They reported that the amount of cystine in the urine was greatly reduced when the patient was put on a low protein diet. They believed that the amount was still further reduced by the administration of 6 to 10 gm. (90 to 150 gr.) of bicarbonate of soda daily. However, it has since been demonstrated that the giving of alkalis merely keeps the cystine in solution in the urine.

Crowell, in 1924, was the first to demonstrate the disintegration of cystine stones by alkali therapy. This case required 17 months for the dissolution of bilateral renal calculi with oral administration of alkali plus lavage of the renal pelves with 1% mercurochrome.

The same general principles of treatment as of all stones are used—forced fluids, removal of foci of infection, free drainage, etc. In addition to all these, add a high alkaline ash diet with moderate restriction of protein, and give alkalis by mouth to prevent recurrence or to dissolve existing stones, *i.e.*, high alkaline ash, low protein diet, plus alkalis by mouth. We have used soda bicarbonate 6 to 10 gm. daily. Citrocarbonate (Upjohn), or citrosoda (Abbott) ounces 1 to 2 daily are more palatable, to alkalinize the urine. To dissolve stones a urinary pH 8 to 8.5 is required. This regimen does not prevent cystine

excretion but keeps it in solution, prevents precipitation, and dissolves existing cystine stones.

Since 1943 we have routinely done cystine tests on the urine of all patients admitted with urolithiasis and a history of renal or ureteral colic. To the present date we have had six cases of cystine calculi treated successfully, and have two new cases with early staghorn type of renal calculus under treatment. One of the latter (Case 8) has had a previous operation on his left kidney, and now has a non-functioning left kidney. There is staphylococcus aureus infection accompanying the existing stone in the good kidney.

The other case (Case 7) was a woman about five months' pregnant with an early staghorn calculus in the right kidney, and a moderate ptosis with hydronephrosis and hydro-ureter of pregnancy. This case was complicated by a pyelonephritis, but she had no exacerbation since treatment was instituted. In the last x-ray the stone appeared slightly smaller and less dense.

Of the treated cases two will be presented. The other cases have, so far as we know, had no further stones since removal of their calculi.

In our series of 8 cases only Case 1 was a Jewish patient. It is interesting to note that this is the only case in which we have been able to demonstrate another of the family being a cystinuric. One sister has a positive test for cystinuria but has never formed a stone. The urinary infection in this case was only completely eradicated after the stone was dissolved.

Case 2 was also complicated by renal infection which resisted treatment until some of the stones were removed, and those remaining dissolved or passed. These first two cases both had a hypoplastic right kidney.

Case 3 unfortunately had a nephrectomy following an attempt to relieve his very severe pain by a nephrolithotomy. In the light of our present experience surgery would not be attempted in a similar case.

Case 4 had a long history of persistent and recurrent bouts of colic with infection. Since treatment was instituted he has had no further attacks of either stone or infection.

Case 5 had four or five attacks of renal colic and passed 20 to 25 small stones on several occasions. Since treatment he has had no further attacks. His urine was not infected.

Case 6 represents our only case of a bladder stone and was unaccompanied by stone in the upper urinary tract. A moderate degree of prostatic hypertrophy with co-existing obstruction would appear to have retained the stone in the bladder following passage from the upper tract.

Unfortunately we have not been able to investigate all the other members of these families for cystinuria.

CASE 1

J.H., male, aged 30 years. Born in Poland. Hebrew. Admitted to the Urological Service of the Royal Victoria Hospital, October 10, 1941, complaining of: intermittent pain and discomfort in the left groin, off and on, for the past two years; burning on voiding, with cloudy urine for one day preceding admission.

This man's urological history dates back to the age of 7 years, at which time he had a bladder stone removed by a suprapubic operation. He had no further symptoms until 1933, when he passed a small stone. In 1935 he had another attack of severe left loin pain but did not pass any stone. In 1937, a stone one inch long was removed from the left kidney by a pyelolithotomy. The stone was reported as being cystine. In 1939 he had another attack of colic but examination at this time was negative. In January 1941, he was told he had a stone forming in the left kidney. In September 1941, an x-ray showed the stone to be increasing in size.

Functional enquiry and physical examination, were essentially negative. Well healed left loin scar and no costo-lumbar tenderness. Urine: straw hazy, 1.016, pH 6 to 7, albumin +, sugar none. Microscopic, pus ++. Red blood cells +. Epithelial cells, many rods. Two hour phenosulphonphthalein test 65%. Blood count and blood chemistry within normal limits. Urine specimen from left kidney pus ++. Urinary pH 7.5 from each kidney. Cystine test positive in the urine from each kidney. Relative kidney function tests (phenolsulphonphthalein and urea clearance) were within normal limits. Cultures of ureteral urines: right kidney specimen no growth; left kidney specimen hæmolytic *B. coli*. K.U.B. film and pyelograms showed a moderate sized staghorn calculus (1½ x 2½ cm.) present in the left kidney, with pyelonephritis chronic left. Hypoplasia of right kidney.

He was placed on a low protein diet plus alkali by mouth to alkalinize the urine. His urinary infection was treated with sulfanilamide. He was discharged from the hospital on this treatment.

On March 14, 1943, the patient returned following a two-day attack of severe pain in the left groin, radiating to the front of the abdomen and down along the course of the left ureter. He had not been following his diet and had been taking alkali sporadically. Physical examination was essentially negative. Urine: straw hazy, 1.016, pH 6.5, albumin trace, surgar none. White blood cells scattered to one plus, red blood cells scattered, epithelial cells, rods. Cystine test positive. Two hour phenolsulphonphthalein test 50%. Blood chemistry normal. Culture of bladder urine *B. coli anærogenes*. Intravenous pyelography, March 18, 1943, showed hypoplasia of the right kidney. Left, there is a faint outline, cast-like in appearance, forming a staghorn calculus. The 60-minute film shows delayed emptying of the left kidney with a dilated pelvis and ureter. Ureteral urine cultures *B. coli* from both kidney specimens. There were scattered pus cells from the left, and rare pus cells from the right kidney specimens.

During this stay in hospital, the pH of the urine was raised to and kept at 8 to 8.5 by a high alkaline ash, low protein diet plus citrocarbonate 1½ ounces daily. On the tenth day of this regimen he passed several small

stone fragments which were proved to be cystine. K.U.B. film, March 27, showed the stone to be disintegrating.

He was discharged to report weekly to our Stone Clinic for urinalysis, and to continue the alkaline regimen. He was given sulfathiazole 1½ gm. a day for four days of each week to combat the infection present. K.U.B. film, April 7, showed a decrease in size and density of the calculus.

On June 9, 1943, he returned for a check-up. His only complaint was burning at the beginning and end of voiding. Urine: clear straw, 1.010, pH 8, albumin trace, sugar none. White blood cells rare to occasional, rare rod. Cystine test positive. Two hour phenolsulphonphthalein test 55%. Excretory urogram, June 11, showed a hypoplastic kidney on the right. Left, no evidence of opacities suggestive of stone, and no filling defects seen. Well filled pelvis with some blunting of all calyces, especially of the middle and inferior groups.

Since his previous examination the opacity has completely disappeared. He was advised to continue with the diet and medication for one week of each month. For the remainder of the month he is to follow no special regimen. His urinary infection has also improved.

On May 5, 1945, patient returned for an x-ray. He has no complaints. Urine: yellow clear, 1.011, pH 8, albumin none, sugar none. White blood cells rare, epithelial cells, no organisms. His burning on voiding has entirely disappeared. He has gained weight and has lost no time from work. In a K.U.B. film, May 5, no opacities suggestive of stone could be seen.

CASE 2

A.D., male, age 27 years. Born in Quebec. French Canadian. Admitted to the Urological Service of the Royal Victoria Hospital, June 3, 1943, complaining of: severe pain in left mid-back region, off and on for 15 months; accompanied by bouts of chills, fever, and cloudy urine.

He first hurt his back in 1940 in a fall from a truck. From January, 1941, to June, 1943, he had three attacks of severe colicky pain with hæmaturia, fever, and pus in the urine. He had never passed a stone. He had x-rays at his local hospital on May 28, 1943, and was told he had a stone in his left kidney. No family history of urinary calculi was given.

Functional enquiry and physical examination were essentially negative except for left costo-vertebral angle tenderness, and a blood pressure of 150/80. Urine: pale straw, 1.010, pH 6.5 to 7, albumin +, sugar none. Microscopic, white blood cells scattered, red blood cells occasional, epithelial cells, rods and cocci (methylene blue stain). Two hour phenolsulphonphthalein test 30%. Culture of bladder urine: *B. proteus* and micrococci. Blood chemistry normal. Mosenthal, specific gravity 1.004 to 1.008. Night volume 480 c.c., specific gravity 1.006. Retrograde pyelograms, June 5, 1943. Right—hypoplasia with hydronephrosis. Left, large kidney outline with an opacity 1" x ⅝" beside and lateral to the tip of the ureteral catheter. Multiple small opacities in clusters in the area of the middle and lower calyces. No dye was injected past the large opacity. Ureteral urine specimens. Right, rare to occasional pus cell. Left, occasional pus cell in the washing from the left ureteral catheter. Cultures, right, moderate growth of pseudomonas. Left, light growth of chromobacters and *B. proteus intermedius*.

On June 14 a pyelolithotomy and a nephrolithotomy was done as the left kidney was completely obstructed. The large stone was easily removed through the pyelotomy incision, but a nephrotomy was necessary to remove many small smooth stones from the middle and inferior calyces. F. 20 soft rubber catheter placed through the nephrotomy wound with an F. 18 in the renal pelvis through the pyelotomy incision. Postoperative through and through irrigation with "G" solution to dissolve the stones that were left behind, and later with normal saline to clear up the renal infection. Report of chemical analysis showed cystine calculi. Cystine test of urine strongly positive.

The patient was placed on a high alkaline ash, low protein diet and given citrocarbonate, 3 1 q. i. h. daily by mouth. The postoperative course was uneventful, and the patient was discharged with instructions to carry on with the above regimen, and report back in two months. X-ray before discharge showed a cluster of small opacities in the region of the middle and inferior calyces.

On August 22, 1943, patient was re-admitted. He had been in good health and had no complaints. Physical examination was essentially negative. The loin scar was well healed and blood pressure was 124/84. Urine: hazy pale straw, 1.010, pH 8, albumin trace, sugar none. White blood cells scattered with occasional clump, epithelial cells, occasional rods. Phenolsulphonphthalein in 2 hours 40%. Mosenthal test, specific gravity variations 1.009 to 1.013. Urea clearance test improved. Cystoscopy with pyelograms; rare pus cells in specimens from both kidneys. Cultures show moderate growth of pseudomonas, bilateral. Right pyelogram, hypoplastic kidney with hydronephrosis. Left pyelogram, several small opacities in the lower calyx with dilatation of all calyces, especially the middle and lower groups. The renal pelvis is normal. During this period in hospital the pH of his urine remained at 8 to 8.5. He left the hospital to continue with the same regimen.

On March 2, 1944, he was again admitted for study. He had no complaints, had gained 15 pounds, and had been working since his last admission. Physical examination essentially negative. Blood pressure 125/78. Urine: straw hazy, 1.012, pH 8 to 8.5, albumin trace, sugar none. White blood cells scattered, red blood cells rare, epithelial cells and rods rare. Culture of bladder urine *B. proteus*. Phenolsulphonphthalein in 2 hours 40%. Blood chemistry normal. Intravenous pyelography. Right kidney hypoplasia with hydronephrosis. Left kidney four small opacities in the lower calyx; two the size of a pinhead, one the size of a pea, and one between these in size. All calyces appear dilated. During this stay in hospital he passed two small cystine stones proved by chemical analysis.

March 13, 1944. X-ray before discharge from hospital showed two faint, small, opacities still present in the region of the lower pole of the left kidney. He was advised to continue the diet and alkalis, and report back in six weeks. Unfortunately we have been unable to contact this patient for further investigation.

SUMMARY

1. We have presented eight cases of cystine calculi complicating cystinuria. Seven of these cases have been diagnosed since June, 1943 (*i.e.*, in the past two years). We have no figures on the number of cases of cystinuria, since we have done a routine cystine test only on the urine of those patients with urolithiasis or giving a history of renal or ureteral colic.

2. An accurate and easily performed clinical test for cystinuria has been presented.

3. The value of routine hemisection and chemical analysis of urinary calculi has been illustrated.

4. In addition to the low protein diet and the giving of alkalis by mouth, we have added a high alkaline ash diet. We have found that this regimen more readily raises the urinary pH to the required level (pH 8 to 8.5) for the dissolution of cystine calculi. We have used citrocarbonate (Upjohn) and citrosoda (Abbott) as

they are more palatable than bicarbonate of soda, and cause no gastro-intestinal symptoms when given in large doses. We have observed no untoward effects from this treatment. However, we advise that the patient's CO_2 combining power of the blood be taken frequently.

5. Once the cystine stones have been removed, future calculus formation can be prevented by following for one week of each month a high alkaline ash, low protein diet with sufficient alkali by mouth to render the urine alkaline, preferably to raise it at least to a pH of 8. This not only prevents crystal formation but will readily dissolve any small cystine calculus or calculi that may have formed in the interval.

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THE CONCURRENT USE OF LIVER AND THIOURACIL*

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THAT thiouracil is a valuable agent in the control of hyperthyroidism is now an established fact. Its use, however, is limited because of its toxic side-effects, the most serious of which is agranulocytic angina. Influenced by the fact that administration of liver was an accepted form of therapy for this complication we adopted the routine of administering liver concurrently with thiouracil, as a prophylactic. This practice was supported also, on experimental grounds, by Goldsmith and his coworkers[1] who found that the concurrent use of solubilized liver with toxic doses of thiouracil to adult rats almost completely prevented the development of neutropenia.

In our first series of 13 patients treated with thiouracil we administered intramuscularly 2 c.c. of crude liver or 1 c.c. of concentrated liver extract twice a week. Of this group one patient developed agranulocytic angina.

CASE 1

S.F., a 62-year old woman who had a toxic nodular goitre was started on thiouracil on September 30, 1944. She took 0.6 gm. daily for the first 2 weeks and 0.1 gm. for the next 3 weeks. The drug was then discontinued because she showed no improvement.

On November 29, she was admitted to the Mount Sinai Hospital for a thyroidectomy. Her symptoms were typical of thyrotoxicosis. She had lost 16 pounds in the past 5 months, now weighing 102 pounds. Her skin was warm and moist. There was no exophthalmos. The right lobe of the thyroid was visibly enlarged. The heart was enlarged, rhythm was regular and the rate was 100 per minute. The blood pressure was 200 systolic and 80 diastolic. The basal metabolic rate was plus 27, the leukocyte count was 14,000 and the polymorphonuclears 88%.

She was started on 0.8 gm. of thiouracil daily and on December 5, there was subjective improvement. The basal metabolic rate was plus 9. On December 6, the patient was under our care. The dose of thiouracil was reduced to 0.4 gm. daily. On December 9 Lugol's solution was added preoperatively. On December 11 the basal metabolic rate was plus 21 and the thiouracil dosage was increased to 0.8 gm. daily. On December 12 the leukocyte count was 3,300 and on the following day the thiouracil was discontinued.

The patient was given crude liver extract intramuscularly, 2 c.c. on November 30, December 5, 8, and 11, and 3 c.c. on the 13. Other medication consisted of phenobarbital when necessary and nembutal gr. ¾ at bed time.

On December 14, the day the thyroidectomy was performed, the leukocyte count was 2,100. Following the operation the temperature was between 100.4 and 102.6 for 8 days. The leukocyte count and the polymorphonuclears continued to drop and by December 20 the leukocyte count was 600 and no polymorphonuclears were to be seen on the smear. From here on there was a gradual improvement in the blood picture. On December 25 the leukocyte count was 5,000 with 12% polymorphonuclears and on the following day the leukocyte count was 6,050 with 73% polymorphonuclears.

During the agranulocytic phase the patient complained of weakness and sore throat. The pharynx was inflamed and there was a small ulcer on the left tonsil. Treatment during the agranulocytic phase consisted of concentrated liver 1 c.c. and crude liver extract 5 c.c. intramuscularly, daily from December 15 till the 23rd, pentnucleotide December 16, 17 and 18, penicillin 15,000 units q. 3 h. for 6 days (December 18, till the 24th) and pyridoxine HCl. intravenously 25 mgm. on December 20, 21 and 22. She began to show signs of clinical improvement on December 24 and on the 28th she was well enoough to be discharged from the hospital.

This adverse experience made us realize that it was unsafe to place our reliance on liver as a prophylactic against thiouracil-induced granulocytopenia and that the best method of preventing such a complication would be to exercise

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greater caution in the management of our future cases. However we felt that further confirmatory evidence was necessary to convince us that liver is of no value in the prevention of granulocytopenia.

On the assumption that our poor result might probably have been due to inadequate dosage or improper technique we decided in our next series of cases to approximate our technique as closely as possible to that employed by Goldsmith and his co-workers.[2] In our next group of 20 patients, on the advice of Goldsmith, we administered Wilson's solubilized liver (Fraction L) by mouth, 20, 0.5 gm. capsules a day in divided doses concurrently with thiouracil. This regimen however appeared no more effective than our previous method, in that 2 patients developed definite signs of granulocytopenia.

CASE 2

M.G., a 30-year old woman began to have symptoms of hyperthyroidism at the end of January, 1945, about two weeks after a severe attack of tonsillitis. When first seen on March 13, 1945, she complained of progressive weakness, excessive perspiration and dyspnœa. In December, 1944, the patient went on a reducing diet. She lost 27 pounds, now weighing 145 pounds. Her skin was warm and moist, and there was a slight diffuse enlargement of the thyroid gland but no exophthalmos. The pulse rate was 104 and the blood pressure was 144 systolic and 82 diastolic. The basal metabolic rates determined on March 15 were plus 53 and plus 66. On April 2 the basal metabolic rate was plus 81, the leukocyte count was 5,900 with 54% polymorphonuclears and 42% lymphocytes. On April 3 she was started on thiouracil, 0.2 gm. 3 times daily. Adjunctive therapy consisted of 5 Wilson's liver capsules 4 times daily. On April 9 there was subjective improvement. The leukocyte count was 6,700 with 59% polymorphonuclears and 33% lymphocytes. When seen on the morning of April 12 she complained of aches and pains all over her body for the past 12 hours. Her temperature was 100 but the physical examination including the nasopharynx revealed no abnormality. The leukocyte count was 3,750 with 53% polymorphonuclears and 38% lymphocytes. Thiouracil was discontinued and liver was increased to 25 capsules daily. In the evening the patient felt better and her temperature was normal. The following day the leukocyte count was 4,500 with 24% polymorphonuclears and 73% lymphocytes. On April 14 the leukocyte count was 6,450 with 37% polymorphonuclears and 53% lymphocytes and thiouracil was again started, 0.1 gm. daily. On April 17 the leukocyte count was 5,900 with 51% polymorphonuclears and 45% lymphocytes, and thiouracil was increased to 0.1 gm. 3 times a day and liver continued at 25 capsules daily. The hyperthyroidism gradually subsided and on May 27 she was well enough to be put on a maintenance dose of thiouracil 0.1 gm. per day.

Believing that the attack of tonsillitis in January had precipitated her hyperthyroidism, tonsillectomy was done on July 10. On September 25 the maintenance dose of thiouracil was discontinued.

CASE 3

M.K., a 53-year old woman first presented herself at the Metabolic Clinic on June 6, 1945. She gave a history of having had a goitre for about 20 years. For the past 3 months however, she had had definite symptoms of thyrotoxicosis. She was very excitable, easily fatigued and perspired freely. Her weight, which was 143½ pounds, had not changed in the past 2 years. Her skin was warm and moist; there was no exophthalmos. There was a large adenoma in the right lobe of the thyroid gland and a smaller one on the left side. Her hands showed a definite tremor. The blood pressure was 172 systolic and 94 diastolic and the pulse rate was 120. Her basal metabolic rate was plus 57. The leukocyte count was 8,300 with 62% polymorphonuclears and 36% lymphocytes. We advised the patient to have a thyroidectomy but she wished to postpone it. Thiouracil therapy was started on June 7, 0.2 gm. 3 times daily. Adjunctive therapy consisted of 5 liver capsules 4 times daily, vitamin C 100 mgm. tablet 3 times daily, B complex vitamin tablet 3 times daily and phenobarbital gr. ¼, 4 times daily. On June 20 the leukocyte count showed a drop to 3,800 with 45% polymorphonuclears and 53% lymphocytes. The thiouracil was reduced to 0.1 gm. 3 times daily. On June 22 the leukocyte count was 3,950 with 37% polymorphonuclears and 61% lymphocytes. Thiouracil was discontinued. On June 25 the leukocyte count was 4,500 with 56% polymorphonuclears and 44% lymphocytes. On her visit to the clinic on July 4 thiouracil was readministered, 0.1 gm. 4 times daily. She was given enough tablets to last for a week but to date of writing she has not returned to the clinic.

COMMENT

Our report does not include the cases which during the period of observation showed, at one time or another, leukocyte counts between 5,000 and 4,000 and granulocytes between 50 and 40%, since moderate leukopenia and granulocytopenia is not an uncommon finding in thyrotoxicosis. For this same reason there may be some doubt whether the granulocytopenia in Case 3 was induced by thiouracil. But even 2 cases of thiouracil-induced granulocytopenia in our series would represent an incidence as high as found in most reports of series of cases treated with thioracil without adjunctive therapy being employed to prevent neutropenia.[4, 5, 6]

This disturbance is usually of a transitory nature and if noticed in its early stages and treated accordingly, serious complications can be avoided in most cases. It is now generally agreed that 0.6 gm. should be the daily optimal dose of thiouracil. Patients are examined and blood examinations are made every 2 or 3 days during the first month of observation when the thiouracil dosage is at or near the maximum. As the dosage is reduced the intervals between the visits are lengthened. Patients are instructed to notify us as soon as an untoward symptom develops. At the first sign of leukopenia and granulocytopenia thiouracil is either discontinued or the dosage reduced to half or less. Blood examinations are then made daily until there is a return to normal. When thiouracil is resumed the dose is half or less the previous dosage. However, there is, at

least potential danger connected with the use of thiouracil and until the drug is modified and made less toxic, its use will, most likely, remain limited.

Of the 33 cases of hyperthyroidism treated with thiouracil that have been under our care or supervision, 13 were given the drug preoperatively, 5 because of postoperative recurrence, 6 because surgery was refused and 9 because surgery was considered inadvisable. Thiouracil failed to bring about the desired effect in 3 of our patients. One of them had hyperthyroidism as part of the syndrome of acromegaly. It might be of interest to mention in passing, that this patient was operated on after five months of thiouracil therapy and the thyroidectomy not only controlled the hyperthyroidism but was followed by an improvement of the acromegalic state.

Vitamin C, folic acid and pyridoxine have also been advocated as prophylactics against granulocytopenia. In our opinion these too will not stand the test of time. Vitamin C, 300 mgm. daily taken by Case 3 did not prevent granulocytopenia. Folic acid and pyridoxine are components of liver and the dosage of liver we administered to Cases 2 and 3 was, we believe, large enough to contain sufficient of these principles to show their effectiveness.

Apparently the patients developing neutropenia become sensitized to thiouracil and there seems to be no way of detecting these individuals. On the chance that a scratch test with a saturated solution of thiouracil might be of some aid, we did this in Case 1 and in two patients who had no side effects from thiouracil. As expected all results were negative.

There is reason to believe that agranulocytic angina can, in most cases, be prevented if proper measures are taken at the right time. It is quite possible that had thiouracil not been discontinued in Case 2 as soon as toxic symptoms manifested themselves and the blood showed early signs of granulocytopenia, the patient would have developed agranulocytic angina.

If this serious complication does develop, penicillin by combating infection until spontaneous granulocytic regeneration takes place, seems to be the drug of choice.[7] What rôle the pentnucleotide, pyridoxine and liver played in the regeneration of the granulocytes in Case 1 is, of course, questionable but we are reasonably certain that the penicillin prevented the spread of infection, which, if not checked, might have proved fatal.

Although we found liver ineffective in preventing granulocytopenia, we continue to employ it because we believe that the daily oral administration of liver in adequate dosage lessens the incidence of the milder toxic effects induced by thiouracil. According to the literature these reactions occur in about 10% of the cases and consist of various types of dermatitis, fever, headache, swelling of the submaxillary salivary glands, arthritis, œdema of the legs, gastro-intestinal upsets, crystalluria and microscopic hæmaturia. In our first group of 13 patients, where injectable liver was given twice weekly, one patient developed a maculopapular rash about 5 cm. in diameter on the right forearm, another had headache and nausea which may not have been due to the thiouracil and the third had headache, nausea and renal irritation with no microscopic blood in the urine. In the next group of 20 patients where oral liver was administered daily, only 1 patient developed one of the above complications, namely swelling of the right submaxillary salivary gland.

SUMMARY

Although thiouracil is recognized as an effective agent in controlling hyperthyroidism, its use is limited because of the possibility of toxic side-effects, the most serious of which is agranulocytic angina. To overcome this difficulty, liver was given concurrently with the thiouracil in the hope of preventing granulocytopenia which at times progresses to agranulocytic angina.

In our first series of 13 cases where parenteral liver (2 c.c. crude or 1 c.c. concentrated) was administered twice weekly, one patient developed agranulocytic angina. In our second group of 20 cases, where oral liver was administered daily in what was considered adequate dosage, 2 patients developed granulocytopenia.

Judging from our experience we would state that neither liver nor any other known agent can be depended on to prevent thiouracil-induced granulocytopenia. There is reason to believe that agranulocytic angina can, in most cases, be prevented if the management of the patient is such that it enables the physician to detect and treat the early signs of this complication. At the first suggestion of leukopenia and granulocytopenia, the thiouracil should be discontinued or the dosage reduced to half or less. If

agranulocytic angina does develop, penicillin, which combats infection until there is spontaneous regeneration of the granulocytes, is in our opinion the drug of choice. Although liver does not prevent granulocytopenia we believe that its daily oral administration lessens the incidence of the milder thiouracil side-effects.

We are indebted to Lederle Laboratories and to Wilson Laboratories who supplied us with thiouracil and liver respectively for this work.

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RÉSUMÉ

Deux séries d'observations démontrent que le foie de veau ne protège pas complétement contre l'agranulocytose chez les malades soumis au thiouracil. Il s'agit chez ces malades d'observer rigoureusement l'hémogramme, de continuer l'administration du foie et de diminuer ou de cesser à temps l'usage du thiouracil. Dans les cas observés au tout début, la pénicilline semble être l'agent de choix pour juguler l'infection jusqu'à ce que les granulocytes se régénèrent spontanément. Le foie de veau n'empêche pas l'agranulocytose mais il en diminue la fréquence.

JEAN SAUCIER

SILICONES AND BLOOD COAGULATION

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THE clotting of blood is markedly influenced by the nature of the surface with which it comes in contact. Following the discovery by Freund[1] in 1886, and by Bordet and Gengou[2] in 1901, that coating of vessels with vaseline or paraffin markedly delays clotting, it has been generally assumed that an important factor initiating clotting is contact of the blood with a wettable surface. However, there has been no available material sufficiently effective and sufficiently adaptable to be of general practical use in delaying the clotting of mammalian blood. Recently certain plastics, the silicones, have been developed which possess water-repellent properties.[3, 4, 5] These substances are polymers derived from organic silicon compounds, and a wide variety of types is available. It has been found that one of these compounds (General Electric Dri-Film No. 9987) has valuable properties in delaying the clotting of blood.

METHODS

All glassware, etc., was scrupulously cleaned and dried before use. To obtain an effective film, General Electric Dri-Film No. 9987 (methyl-chloro-silane) was applied in liquid form by pouring it into or through the glassware and needles used. The methyl-cholorosilane was left in contact with the object for a few seconds and the excess was poured off. The object was then rinsed thoroughly with distilled water. This formed the silicone by hydrolysis and fixed it on the material. The last traces of hydrochloric acid liberated were removed by rinsing with very dilute ammonia water followed by copious washing with distilled water, and the articles dried in hot air. This procedure gives a film much heavier than the unimolecular film recommended by the manufacturers. In our experience this heavier film is essential for use in a study of the clotting system.

A fresh application of the silicone is made each time the glassware, etc., is used. It is our impression that the surface is improved with the second and third coatings, so that we now subject all new glassware and needles to three or four treatments. (Some etching of the needles has been observed). For aseptic use, the prepared syringes and needles are placed in boiling distilled water for 1½ to 2 minutes.

Clotting times were determined in standard 8 mm. pyrex test tubes at 20° C., the formation of a complete gel being taken as the end point. Platelet counts were made from samples taken into a formalin citrate mixture as described previously.[6] Blood samples were taken from the antecubital vein. Rubber tubing clamped in a hæmostat was used as a tourniquet and the pulse palpated to make sure of a good arterial flow.

RESULTS

Effect of silicone surfaces on clotting time.—In order to test the effect of the silicone treatment on clotting, 5 c.c. blood samples were removed with a needle and syringe previously treated with the silicone. The needle was removed and 1 c.c. of blood placed in treated and untreated tubes. The results are shown in

Table I. In all cases there was a marked lengthening of the clotting time in the silicone tube to about twice the clotting time of the control. In a few tests with a paraffin coating a similar effect was observed, but it was much less than with the silicone.

In a different experiment (Table II) the effectiveness of silicone in preventing coagulation

TABLE I.
COMPARISON OF EFFECT OF TREATMENT OF TUBE.

		Clotting time of blood, mins.		
		Plain tube	*Silicone*	*Paraffin*
Dog.....	1	15	29	24
	2	21	35	
	3	13	31	
	4	18	30	
Rat.....	1	6	13	
	2	2	4	2
	3	4	6	
Man.....	1	10	18	8
	2	11	31	15

TABLE II.
CLOTTING OF BLOOD IN SILICONE

Tube	*Clotting time mins.*
1	133
2	116
3	>> 52 (Glass, 13)
4	70
5	61
Plasma.....	20 (Glass)
	120 (Silicone)

was further demonstrated, and another important factor affecting clotting time was studied. Fifteen c.c. of blood were taken with a silicone-coated syringe and needle, the needle removed and 5 c.c. of blood placed in each of two centrifuge tubes. The remaining 5 c.c. were then divided in 1 c.c. portions between small tubes and the clotting time determined at 20° C. Tube 5 represented the blood last out of the syringe, and presumably first out of the body; tube 4, the second last, and so on. The clotting time in silicone of tube 5 was 61 minutes, of tube 4, 70 minutes, of tubes 2 and 1, 2 hours. The much shorter clotting time of the last 1 c.c. of blood in the syringe is a fairly consistent finding. We believe that this is due to the small amount of tissue juice or thromboplastin which enters the needle when passing through the vein wall and overlying tissues, since we found that any more extensive damage will cause the sample to clot in 20 minutes or less. Thus, samples where the needle caught in a valve or where the vein wall collapsed against the needle, or when a hæmatoma developed, all clotted in a short time. Evidently silicone cannot protect against the clotting activity of damaged tissue. However, by avoiding eddy currents which would cause mixing, the slight amount of thromboplastin added to the blood on inserting the needle can be confined to the first 2 c.c. of blood. To improve control of this factor, in all further experiments 5 c.c. of blood were left in the syringe. As a check, the clotting times were determined serially for the 5 c.c. as in Table II.

Tube 3 is of interest. After standing 52 minutes the blood was still completely fluid with no sign of clotting. It was therefore transferred to a glass tube, using a dry syringe and needle, and gave a clotting time of 13 minutes which is a normal value.

The blood in the centrifuge tubes was spun to obtain plasma. The clotting time of this plasma was 20 minutes in glass, 2 hours in silicone. Further discussion of this point will be given later.

Preparation of normal plasma.—It is evident, therefore, that with suitable precautions to prevent contamination with thromboplastin we can, by the use of silicone, delay clotting of blood up to two hours at room temperature. By this means it is possible to obtain plasma without the use of anticoagulants, and without modifying the clotting system in any way. After obtaining the plasma it can be stored in the refrigerator. We have stored samples of plasma for periods up to six weeks. They were quite fluid and when brought back to room temperature they clotted like normal plasma.

Preservation of platelets.—The formed elements of blood were studied, using the technique outlined above. Ten c.c. of blood were placed in a silicone-coated beaker at room temperature and samples were removed at

TABLE III.
CELL COUNTS AND CLOTTING TIME OF BLOOD STORED IN SILICONE

Time mins.*	*Red blood cells /mm.³*	*White blood cells /mm.³*	*Platelets /mm.³*	*Clotting time mins.*
1.....	4,100,000	6,200	253,000	39
15.....	4,344,000	7,900	263,000	34
30.....	4,050,000	5,200	271,000	31
45.....	5,319,000	4,700	139,000	19
64.....	....	....	....	10
73.....	....	....	....	6
79.....	clotted	....	....	..

*Time from removal of needle from vein.

intervals for the estimation of cells and clotting time. The results are shown in Table III. After 30 minutes the platelets still gave a normal count with no sign of agglutination. The clotting time (31 minutes) also was only slightly shortened. Samples taken after 45 minutes outside the body showed a marked reduction (50%) in the platelet counts and the clotting time was also reduced to half the original value. It is of interest that some decrease in the white cell count was also observed at this time while, due to sedimentation, a rise in the red cells had occurred. The preservation of the platelets for 30 minutes is remarkable, since even with large doses of heparin, platelet agglutination and disintegration is very rapid in blood samples taken by ordinary techniques without oxalate or citrate.

have any significance. We have therefore studied the influence of platelets by the silicone technique. The results are shown in Table IV. In seven experiments, blood removed with the usual precautions was placed in two centrifuge tubes and centrifuged at different speeds to give plasmas of different platelet content. In the last two experiments the blood was placed in one tube and the plasma decanted after different periods of time in the centrifuge. In all samples the platelet count and clotting times in glass and silicone were determined.

We will first consider the experiments which were not successful. These results must be discarded in assessing the influence of platelets. However, they do demonstrate the great activity of the tissue factor which was mentioned earlier. In experiment 30, a hæmatoma de-

TABLE IV.

PLATELET COUNTS AND CLOTTING TIMES OF PLASMA

Experiment	*Subject*	*Sample*	*Platelet count per mm.³*	*Centrifuge time mins.*	*Clotting time, mins.*	
					Glass	*Silicone*
21	L.B.J.....	A	158,000	5	20	118
		B	15,000	7	85	205
23	E.F.....	A	552,000	5	19	84
		B	77,000	13	38	130
30	E.F.....	A	378,000	8	(21)	(29)
		*B	3,300	25	(12)	(14)
31	A.M.....	A	148,000	5	19	105
		B	6,900	21	47	93
34	L.B.J.....	**A	clot			
		B	103,000	11	64	134
35	L.B.J.....	A	58,000	7	60	249
		B	22,000	20	47	236
62	E.F.....	A	86,000	7	38	86
		B	2,500	18	71	116
66	E.F.....	A	600,000	3	59	99
		B	8,000	13	97	145
67	L.B.J.....	A	120,000	6	96	396
		B	5,200	16	55	120

Part A centrifuged in the International at 1,250 r.p.m. Part B in the Angle centrifuge at 3,000 r.p.m. B (62, 66 and 67) in International at 2,000 r.p.m. *Hæmatoma developed. **Vein collapsed.

The significance of the platelets in clotting.— We plan to use this technique to study the mechanism and the factors involved in the early stages of clotting. The first problem investigated, the results of which we wish to report at this time, is the influence of the platelets. It is usually stated that plasma within the blood vessels does not clot because the initiation of clotting requires another factor present in cells and particularly in the platelets. Recently Lozner, Taylor and MacDonald[7] have revived the experiment of Bordet and Gengou to show that plasma will clot in the absence of cells and deny that the platelets

veloped while the sample was being taken. Very short clotting times were obtained, particularly in silicone, so that much of the difference between glass and silicone observed in the other samples disappeared. In experiment 34, the flow of blood was slow and the vein collapsed during removal of the last 5 c.c., allowing the needle to touch the intima of the vein momentarily. This portion of the blood, which was first out of the syringe, clotted in the centrifuge, whereas the rest of the sample obtained in the normal way gave the normal long clotting time, and was therefore included in the series.

In examining the main data of the table, it can be observed that the difference between clotting times in untreated ("glass") and silicone-treated ("silicone") tubes is equally marked with plasma. Further, if we examine the pairs of samples for their clotting times in glass we observe that in five of seven experiments the clotting time is longer in the portion with the lower platelet count. Also, plotting the clotting time in glass against the platelet count on logarithmic paper for all the samples gave an approximate straight line, and on calculation a correlation coefficient of –0.45 was obtained. The possibility of this occurring by chance alone was 1:10. Though this correlation is not good, it suggests that an effect of the platelets on the clotting time ought not to be completely discounted.

We can also compare the clotting time of the sample in silicone with the platelet count. In experiment 21 there was a much longer clotting time with the B sample. However, the difference was slight in 23; and in 31 where B showed a count of only 6,900 it had a shorter clotting time than A. Likewise determining the correlation on all the data gave a correlation coefficient of –0.10, which is ascribable to chance alone. Hence the clotting time in silicone shows no dependence on the platelet concentration and the variations in clotting time suggest the influence of some other factor.

If the platelets were the only factor involved in initiating clotting, it should be possible, by sufficiently reducing the platelet count, to render the plasma incoagulable. This we have attempted by taking the upper portion of plasma after centrifuging at high speed. The results are shown in Table V. It is evident that a further reduction of the platelet count to as low as 3,000 or 4,000/mm.^{3} did not markedly increase the clotting time. The average clotting time in glass was 37 minutes, and in silicone 140 minutes. Inspection of the data in Tables IV and V suggests that even at low levels of the platelets, they should still be considered a factor in determining the clotting time in glass, though they are of much less significance in silicone. The plasma did not become incoagulable with the lowest platelet count obtained. Evidently some other factor is operative in causing clotting. The fact that the clotting times in both glass and silicone fail to correspond with the level of the platelet count also indicates this. For example, experiments 21 B, 34 B and 62 B show similar clotting times in glass (85′, 64′, 71′), yet the platelet counts are 15,000, 103,000 and 2,500/mm.^{3}, and the clotting times in silicone are 205′, 134′ and 116′.

Mechanical agitation, as from pouring or from vibration in the centrifuge, and contamination by dust, appear to be of minor importance. But in experiment 67 some such factor might explain why the first sample of plasma poured off should have a clotting time in both glass and silicone very much longer than that of the second sample, yet the platelets had been greatly reduced in the latter. As a measure of the factor involved in manipulation of the samples, a comparison is made in Table V of the longest time in silicone of the residual blood left in the syringe with the clotting time of the plasma in silicone. The difference between the clotting time in silicone of plasma and blood is partly due to the fact that the twenty minutes in the centrifuge is not included in the plasma time. When this is taken into consideration, four samples showed a longer clotting time with the blood and the other four showed a longer clotting time with the plasma.

TABLE V.

PLATELET COUNTS AND CLOTTING TIMES IN GLASS AND SILICONE

Experiment	*Subject*	*Platelet count /mm.^{3}*	*Clotting time, mins.*		
			Plasma in glass	*Plasma in silicone*	*Blood in silicone*
36	L.B.J.	4,000	37	195	141
37	M.B.	27,000	35	121 131	137
38	E.F.	16,000	30	85	218
39	L.B.J.*	4,000	(14)	(39)	175
40	A.M.	3,600	19	105 97	245
43	L.B.J.	6,400	58	118	218
44	A.M.	3,400	45	212	138
	Average.....		37	140	182

Blood centrifuged 20′ at 2,000 r.p.m. Plasma decanted off into silicone. *Fat globule centrifuged out of plasma.

An interesting point was provided by experiment 39. This was a good blood sample as judged by a clotting time of 175 minutes for the blood in silicone, and on centrifuging the platelet count was reduced to 4,000/mm.^{3} However, during the centrifuging a small amount of fat separated out and it could be seen that the fat-plasma interface provided a nucleus for clotting. Hence the short clotting times of 14 minutes for glass and 39 minutes in silicone.

Discussion

It is evident from the results reported that the use of the silicone coating (Dri-Film) gives a surface which can effectively preserve blood from clotting for several hours. In such stored blood the platelets are preserved from agglutination and disintegration up to 30 minutes. Thus it is possible to obtain normal plasma without the use of anticoagulants. Such plasma can be stored at 0° C. for several weeks, and clots on being returned to room temperature. The normal clotting times reported for glass are considerably longer than that usually found. Preliminary tests indicate that this is due to the technique of removal of the blood. It has been found that the use of a silicone-treated syringe, the removal of the needle before emptying the syringe and the discarding of the last blood in the syringe are equally important factors contributing to this.

However, the silicone is ineffective in the presence of tissue damage. The slightest trace of thromboplastin, such as that picked up by the needle in its passage through the skin and vessel wall or by close contact with the intimal surface, is sufficient to clot the blood promptly. By suitable precautions it is possible to obtain blood samples apparently free of such contamination. Plasma obtained from such blood clots in 20 to 100 minutes in glass, 1½ to 6½ hours in silicone. The clotting time in glass is affected by the number of platelets in the plasma. On the other hand, the clotting time in silicone is less affected by the platelet count. This suggests that the effect on clotting of contact of plasma with glass is due either to the direct action of the glass on the platelets or on some factor which influences clotting through its effect on platelets.

While apparently the platelets are preserved in silicone, the plasma still clots independently of their action. Of course, once clotting starts, platelet alterations will take place as a result of the clotting. The initiation of clotting of plasma in silicone must be attributed to some other factor in the plasma. Wooldridge,[8] Lozner, Taylor and MacDonald, and others, have suggested that plasma contains a soluble factor which will initiate clotting. Its nature is not known. The possibility that this is thromboplastin present in circulating blood and derived from cell destruction or from products of digestion, etc., does not appear to have been considered. The extremely small amounts of thromboplastin from tissue damaged by the needle, which will affect the clotting of native plasma, has been demonstrated in these experiments and lends support to this view. The results of the recent experiments of Chargaff,[9] who removed the active factor from decalcified plasma with the ultracentrifuge, also suggest a similar agent.

Since such minute amounts of thromboplastin are effective in hastening the clotting of normal plasma, it may be urged that it is impossible to obtain a sample of blood completely free from significant amounts of tissue juice and tissue thromboplastin, and that we have simply reduced such contamination. While conceding the force of this argument may we point out that, on the same basis, it is equally unreasonable physiologically not to consider the presence in the circulation of a substance as ubiquitous in the body as thromboplastin. Presumably those variations in the data reported in Tables IV and V which did not parallel the platelet count were due to variations in thromboplastin in the sample, in part from admixture on obtaining the sample, and in part due to variations in amount in the circulating blood. Whether the proposed factor in plasma responsible for the clotting in silicone is affected by surface is not definitely known. If it is not, by removing the platelets it should be possible to obtain clotting times in glass approaching those in silicone. Lowering the platelet count to 3,000 to 4,000/mm.^{3} was not sufficient to achieve this.

It will be observed that the conclusions drawn are in agreement with the generally accepted views on blood coagulation. However, the use of silicone makes it possible to secure information which demonstrates these factors in a more convincing manner than has previously been possible. It should be emphasized that in the initiation of clotting, the platelets are a relatively minor factor compared to thromboplastin from damaged tissue, and it is only when the latter is kept to a minimum by careful technique that an effect due to platelets can be observed.

Summary

1. The use of a silicone coating (General Electric Dri-Film) on glassware and needles gives a surface which preserves blood from clotting for several hours. In this blood the

platelets are preserved from agglutination and disintegration up to half an hour.

2. By the use of such coatings it is possible to obtain normal plasma without the use of anticoagulants. Such plasma clots in 20 to 100 minutes in glass, 1½ to 6½ hours in silicone. The length of clotting time in glass is affected by the number of platelets remaining in the plasma.

3. Contamination of blood samples with minute amounts of substances from damaged tissue will clot this plasma rapidly. The effect of these substances on the clotting time of plasma is not influenced by the nature of the surface to which it is exposed.

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THE PRINCIPLES AND PRACTICE OF INGUINAL HERNIORRHAPHY

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SURGICAL repair of inguinal hernia is one of the most commonly performed operations in any modern hospital, but often one of the most poorly executed procedures in the operating room.

If one is to blame the literature, it is mainly in the direction of lack of uniformity, with too much emphasis on one or other "technique" or "method", usually with somebody's name attached. What is all too often understressed or omitted, both in the textbooks and the journals, is an adequate attention to the finer points of surgical anatomy: there is still a very definite need for systematizing the treatment of inguinal hernia on a basis of certain clear-cut principles of anatomy and surgery.

An inguinal hernia consists essentially of the protrusion of abdominal contents within a peritoneal pouch through a hiatus in the transversalis fascia, into the inguinal canal and often beyond it. This hiatus may occur at the internal abdominal ring, medial to that ring, or lateral to it.

The extent of the surgical repair is governed mainly by the size of the defect in the transversalis fascia and not by the size of the sac. The numerous operations which are described in most surgical textbooks are based upon or modified from Bassini's original technique and rely upon reinforcements of the inguinal canal by the construction of an artificial musculo-aponeurotic barrier, rather than a painstaking reconstruction of a firm layer of transversalis fascia. In considering such operations certain disadvantages must be noted.

In the first place it will usually be found that in order to suture the internal oblique and transversus muscle down to Poupart's ligament a fair amount of tension is unavoidable. The operator undertakes to suture these structures together under adequate tension, and yet not tightly enough to cause necrosis of the muscle fibres. Also he is attempting to obtain good physiological union between the smooth convex edge of muscle and the smooth concave surface of inguinal ligament. In operating upon hernial recurrence cases following previous Bassini repairs I have in all cases found that non-absorbable sutures, such as silk, linen or cotton, were not used, that the internal oblique and transversus muscles had separated partially or completely from Poupart's ligament, and that usually a defect of varying size was still present in the transversalis fascia. Such a separation of these muscles can hardly be blamed on coughing and straining, as these acts cause the curved lower fibres of the inguinal muscles to contract and become straighter, which in fact tends to approximate them to Poupart's ligament.

Several factors are probably responsible. In the first place there is the unrelieved upward and medial drag of the rectus sheath border on the conjoint tendon which is attached closely to it. Secondly, there is frequently some degree of ischæmic necrosis in the lower muscle fibres, due to strangulation by sutures which have been tied too tightly in order to obtain adequate apposition of muscles to liga-

ment. Thirdly, with the use of absorbable sutures, even of good thirty day chromic catgut, by the time the sutures have become digested and absorbed, comparatively little union has occurred between the margins of internal oblique and transversus muscles above, and Poupart's ligament below, as would indeed be expected with side-to-side union of muscle and tendon.

To combat these factors certain precautions are therefore required. Now, there is a fair degree of cohesion between the internal oblique and transversus muscles on the one hand and the transversus muscle and transversalis fascia on the other, the layers being partially bound together with areolar tissue. Thus any downward pull on the underlying fascia will automatically tend to bring down these muscles with it, at the same time relieving the rectus-sheath drag referred to above. Such a downward pull is, in fact, obtained in suturing this fascia, as the upper leaf, which was retracted to a varying degree, has to be brought down to the lower leaf, which is attached to iliac fascia.

In order to obtain apposition for a sufficient length of time for even the slowest rate of side-to-side healing between muscles and ligament, non-absorbable sutures, of which silk is probably about the best, should be used throughout. Not only will the use of these non-absorbable sutures ensure such long contact, but by placing the sutures very close together, almost like a lattice, a zone of fibrosis will occur along the suture line and around the individual sutures, which will act as a strong reinforcement of the suture layer itself. By the similar use of non-absorbable sutures throughout the repair, such zones of fibrosis will be obtained at all suture lines and greatly add to the permanent strength of the inguinal region. These sutures are well tolerated by human tissues and do not cause the serous reaction which occurs in the case of catgut, so that there is less exudation of fluid into and between the tissue-layers post-operatively, and with suitable aseptic precautions, less possibility of wound breakdown.

OPERATIVE TECHNIQUE

1. *Incision.*—This should be placed with maximum attention to exposure for adequate dissection and not for cosmetic value. Such fastidious refinements as skin-crease incisions, seem to be carrying the cult of "the body beautiful" to rather absurd extremes, even in this day of minimal bathing apparel. There seems, in fact, little justification for an incision which confronts the operator with difficult retraction from start to finish. A scar running across the grain of skin-creases in this region does not necessarily need to be an ugly scar. For the average case a 3½" straight incision commencing just above the pubic spine and running upwards and laterally ½" above and parallel to Poupart's ligament will provide an excellent exposure, and leave a neat scar. However, I regard the following details, although seemingly rather trivial, as quite essential in all cases.

In the first place the incision should always be marked on the skin by a knife scratch before the actual cutting is done. It is surprising how often, when this little precaution is omitted, the skin-wound is considerably off the proposed line. Secondly, cross scratches are made at intervals of about ¾", as these will prove invaluable at the close of the operation in obtaining accurate apposition of the skin edges. It is this accuracy of cutaneous suture which will largely determine the eventual neatness of the scar. As elsewhere, to sacrifice sufficient operative space for the sake of a "dinky little scar" is entirely indefensible.

The depth to which the knife is carried differs somewhat from the usual procedure. It should be remembered that the majority of the superficial blood vessels in this region run more or less at right angles to the inginual ligament, in the superficial layer of the subcutaneous tissue. The knife, therefore should only be carried through the full thickness of the skin until the yellow shining surface of the fat is encountered. At this point a pair of straight Mayo scissors is repeatedly introduced at right angles to the line of the wound, and spread widely through the full thickness of the subcutaneous tissue. With practice this manœuvre can be done quickly and effectively, and the vessels neatly exposed and isolated for the application of a double row of hæmostats before cutting down to the surface of the external oblique aponeurosis. Hæmostasis by this method is much more satisfactory than the usual method of finding the bleeding points after the vessels have been cut. The field remains dry, the towels remain dry, there is not a large amount of swabbing before the application of skin-cloths, and asepsis can the more be trusted. Incidentally, the operator should be careful not to prolong his cut too far medially, as in this region the subcutaneous tissue is much thicker,

denser and more vascular, and the potentially infected hair-follicles project much more deeply.

Bleeding points are ligated with 000 silk and skin-cloths carefully applied.

2. *Isolation of hernial sac.*—(*a*) The external abdominal ring should first be defined by invagination with the finger tip, and the crura cleared by dividing a thin layer of tissue at this point, the intercrural fascia. The external oblique aponeurosis is then slit up along the line of its fibres from the lateral extremity of the wound to the external ring. This line of division should deliberately be placed as high as possible so as to enter the ring at its upper margin and not at its apex. This little precaution will ensure an adequate lower flap for the later satisfactory closure of external oblique. During both the division and clearing of the external oblique care should be exercised to avoid injury to the hypogastric branch of the ilio-hypogastric nerve, which pierces the aponeurosis just above the external abdominal ring. Also any small vessels found perforating the external oblique in this region must be carefully secured as they are divided, for they may be a source of hæmatoma formation. The upper and lower leaves of the external oblique are then cleared from the underlying structures by gentle blunt dissection, Poupart's ligament being thoroughly exposed as a white, shining, concave, tendinous structure in the floor of the wound.

(*b*) At this stage the internal oblique muscle will be exposed, arching over medially from its attachment to Poupart's ligament towards its entry into the conjoint tendon. Below the curved lower border of this muscle will be seen the parallel bundles of the cremaster muscle covering the spermatic cord, and running along the surface of the cremaster, parallel to its fibres, the ilioinguinal nerve should be identified and protected from injury. The cremaster muscle is now picked up, preferably below the ilioinguinal nerve, and split up along the direction of the cord. Any bleeding points in the muscle edges should be ligated, and the muscle cleared from the underlying structures.

(*c*) In the indirect type of hernia, the whitish surface of the peritoneal sac should immediately present to view, covered only by a thin layer of tissue, the internal spermatic fascia, which binds the hernial sac to the other component structures of the cord. After cutting lightly through this layer, the peritoneal sac is picked up with a hæmostat and dissected from the underlying cord. This dissection is carried out partly by gauze dissection and partly by sharp dissection, the sac and underlying cord being stretched out against the light to determine the areas of relative transparency formed by areolar tissue binding the sac to the vas deferens and pampiniform plexus. The vas deferens can be easily identified as a cord-like whitish structure, looking and feeling not unlike a strand of lightly cooked spaghetti. This as well as the pampiniform plexus must be gently stripped back away from the sac, which is then cleared as far as the internal ring. In order to assist careful dissection around the neck of the sac, the internal oblique and transversus muscles should be strongly retracted upwards and laterally, and separation carried out until the yellow lobulated extraperitoneal fat presents to view. It is at this stage that the neck of the sac should be palpated between fingers and thumb and carefully examined from the exterior, in order to make sure that a pouch of urinary bladder is not adherent.

It will be noted that dislocation of the spermatic cord has not been advocated until after the indirect sac has been dealt with. The common practice is preliminary dislocation, and there is no doubt that the resulting rotation nearly always distorts the normal relationship of the component cord structures and sac. Again it is much easier to dissect a movable structure away from a fixed structure, than from one which has been mobilized. After the indirect sac has been removed, then the cord may be dislocated if a repair is indicated, otherwise (*i.e.*, hernia via normal-sized internal ring), it is left *in situ*.

(*d*) On the other hand if, after division of the cremaster, no peritoneal sac is encountered, the cord should be gently separated from its bed and brought forwards, revealing the direct sac lying posteriorly and easily cleared by light dissection with gauze.

3. *Herniotomy.*—(*a*) Indirect sac. The peritoneal sac is now picked up and opened between hæmostats and the contents, if present, reduced into the peritoneal cavity, dividing any omental adhesions between hæmostats and securing the cut ends by transfixion-ligatures. The neck is now carefully examined from within, and again inspection should be thorough to exclude sliding hernia of the bladder or large

bowel. Other points which can be determined from the inside of the neck by means of the palpating finger are the margins of the gap in the transversalis fascia and the position of the pulsating inferior epigastric vessels. These structures are thus located for subsequent identification. If the neck of the sac has been fully cleared it is then transfixed and ligated in the usual manner, using 00 silk, and the remainder of the sac cut away. On the other hand, if it is possible to clear away an adherent viscus, usually the urinary bladder, it is best to suture the neck from within by a purse-string, taking care not to bite too deeply but merely to take up the full thickness of peritoneum. The peritoneal stump is then allowed to retract away through the opening in the transversalis fascia.

(*b*) Direct sac. If a definite sac is present it should be dealt with as above, but if there is merely a bulge it should be plicated by one or two rows of mattress sutures running transversely and picking up peritoneum only, the needle being carefully inserted so as not to take too deep a bite.

4. *Repair.* — (*a*) Transversalis fascia. The margins of the transversalis fascia are now clearly defined after gentle dislocation of the spermatic cord and upward retraction of the internal oblique and transversus muscles. The fascial edges are then sutured together with a continuous to-and-fro 00 silk suture, the upper leaf being brought down to the lower. If a small degree of tension is required to effect closure a single row of sutures will suffice, but in any case the needle-bites should be very close together. If moderate tension is required two rows of sutures should be inserted, the second row picking up the fascia about ¼" beyond the first row, above and below. Should a great deal of tension be required the further procedure should be determined by the size of the fascial opening. If this is large, as in large direct or recurrent herniæ, repair should be effected with strips of fascia lata, proceeding thereafter to do the usual Gallie repair, which is in effect a Bassini repair with fascial strips. If the opening is not large a double layer of to-and-fro silk sutures may be inserted without tension to form a lattice, the second row being directed obliquely across the direction of the first row to provide a criss-crossing effect.

Where the fascial opening extends laterally, behind the Poupart-attached fibres of internal oblique and transversus abdominis, these muscles should be cut laterally for ½ to 1", close to their attachment to Poupart's ligament, and the edges retracted until the hiatus is fully visualized on the lateral aspect. The lateral part of the defect can then be accurately sutured lateral to the cord, and the remainder medial to the cord, but in any case closure of the transversalis fascia should always be just sufficient to form a new internal abdominal ring which just fits the cord snugly as it emerges from the abdomen. If the lower leaf of the transversalis fascia is thin and fragile, the sutures should be carried down to include the deepest fibres of Poupart's ligament. The operator should watch for the inferior epigastric vessels and avoid accidental puncture with his needle, although there is no reason why these vessels should not be divided between secure ligatures if they impede satisfactory repair. In any fascial defect which extends medially the running silk suture should always commence with a firm bite of Gimbernat's ligament below and posterior surface of the conjoint tendon above, at a point adjoining the rectus sheath border. In this way the suture line is strongly anchored medially so that recurrence in this region is guarded against.

(*b*) Internal oblique and transversus muscles. Having completed the most important part of the repair, these muscles are now sutured down to Poupart's ligament behind the cord, which is held up by a wet tape. The suture, of 00 silk, extends from the lacunar attachment of Poupart's ligament to the new internal abdominal ring, and is inserted as a continuous stitch with closely-spaced bites. Usually after adequate transversalis repair the margins of these muscles can be brought down to the ligament with hardly any tension at all. If, however, any appreciable tension should exist, then the silk is merely inserted as a double lattice, filling in the space between muscle and ligament. If the cremaster muscle is at all well-developed it should be included in the suture-line behind the cord. In any case care should be exercised to avoid encircling the ilioinguinal nerve in the loops of suture, as this nerve lies on the surface of the cremaster. Where the muscles have been divided lateral to the internal ring, they are re-sutured, bringing the upper edges down to Poupart's ligament. Once again, in completing these sutures in the region of the internal ring, closure

should be just tight enough to fit the cord snugly as it emerges from the transversalis fascia.

5. *Closure.*—The external oblique should not, as a general procedure, be regarded as in any way contributory to the repair of this region. It is not particularly strong and often displays several fairly well-marked translucent streaks where the aponeurosis is extremely thin. Similarly, too tight a closure of the external abdominal ring is indefensible, as hernial recurrence depends on the strength of the posterior and not the anterior wall of the inguinal canal. The edges of the external oblique are merely united over the cord with a continuous 00 silk suture, leaving the external abdominal ring just large enough to give the cord free play to and from the inguinal canal, and without constriction. It will be found that this line of suture can be more easily inserted anterior to the cord if this structure is first pushed up and under the upper leaf of the external oblique.

If the subcutaneous tissue is at all thick it should be closed with a few interrupted 000 silk mattress sutures at the points of the cross-scratches on the skin. The skin is then united with 000 silk, interrupted mattress sutures being introduced at the cross-scratches and one or two extra sutures between these as required. A small dry gauze dressing is then applied to the incision line and held in place with a piece of 3″ elastoplast, about 6″ long, and a well-fitting scrotal suspensory applied before the patient leaves the operating room.

POSTOPERATIVE CARE

Essential features of the postoperative treatment are presented only in summary form.

1. Active movements of arms and legs from the start. Frequent turning from side-to-side. Avoid all knee rests (as these only encourage phlebothrombosis).

2. Deep breathing exercises from the start repeated frequently and regularly. Patient encouraged and instructed to clear air passages by unsuppressed coughing, into a sputum cup and not paper tissue.

3. Diet soft from the start, increasing later in order to eliminate many so-called "gas pains" which are often hunger spasms. Less enemata will be required with early liberal diet.

4. Do NOT touch the dressing before the 8th day, when sutures are removed and fresh dressing applied.

5. Bed-rest should be absolute for a period varying from 14 days in small transversalis fascial repairs up to 21 days in extensive repairs. Adequate limb exercises during this period maintain good general muscular tone despite recumbency, and in any case abdominal exercises are commenced on the 14th day.

6. Where the repair is small 3 months should elapse postoperatively before heavy work is allowed, 4 months for moderate repairs, 5 months for extensive repairs.

DISCUSSION

The main theoretical objection to the use of non-absorbable sutures is the possibility of infection, making it necessary to operate again for the painstaking removal of all suture material. However, it has been my experience that with suitable precautions such a danger is indeed quite negligible. In 46 cases of inguinal herniorrhaphy performed during the past twelve months at Dundurn Military Hospital in which black silk suture material was employed, there was only one case of wound infection. This was observed on the 8th day, 5 days after the onset of a febrile sore throat, and it was considered that the infection was autogenous. The wound-infection, however, cleared up completely after simple evacuation of pus via a small separated area of the incision, penicillin and sulfa drugs locally and systemically. No further surgery was required and the incision healed up cleanly leaving a firm, neat, painless scar.

I consider adequate bed-rest essential to the firm healing of the inguinal tissues. During the past 12 months I have seen only one mild pulmonary complication in 46 cases. This was a very small patch of atelectasis in the right lower pulmonary lobe, and it responded rapidly to hypodermic injections of epinephrine 1/1,000 in 0.5 c.c. doses, and penicillin intramuscularly. No other complications were noted. It is difficult to see any real physiological justification for early ambulation following hernial repair. Thus, for example, the fragments of a fractured bone, after being held together by boneplates or wiring, can hardly be expected to unite well unless in addition they are adequately immobilized for a sufficient length of time. In the same way the suture lines of a herniorrhaphy require the comparative immobilization of recumbency to permit adequate healing to take place. To argue that such a

period of bed-rest encourages muscle-wasting, venous thrombosis, and pulmonary complications, seems hardly justified when these postoperative misfortunes can be largely prevented by suitable precautions. The aim of the surgeon is to obtain a firm and permanent repair of the inguinal canal upon which he has operated, and not to see how rapidly he can get his patients on their feet. Healing of most tissues still requires rest of the affected region, but that is no reason why the remainder of the body should not, in the meantime, be frequently and thoroughly exercised.

SUMMARY

1. Certain features of the surgical anatomy of the inguinal region are discussed.

2. A brief critical review is given of the standard Bassini-type operations for inguinal hernia.

3. Operative details are enumerated at some length, with emphasis on repair of the transversalis fascia and the use of non-absorbable sutures.

4. Postoperative treatment is described with stress on early adequate diet, active exercises, and a sufficient period of bed-rest.

5. The use of nonabsorbable sutures and the employment of relatively long periods of recumbency is discussed.

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IDENTIFICATION OF IDENTICAL STRAINS OF STAPHYLOCOCCI IN FOOD POISONING AND OTHER INFECTIONS BY BACTERIOPHAGE TYPING

By W. B. McClure, M.B., D.P.H.* and A. M. Miller

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VARIOUS investigators have shown the existence of phage-carrying strains of different bacteria. Fisk[1, 2, 3] demonstrated that certain staphylococcus strains carry bacteriophage which will cause lysis of other strains of staphylococcus aureus. These bacteriophage-carrying strains are known as "lysogenic". The strains which are lysed are called "susceptible".

The specificity of these phages suggested the possibility of a method which might be used to identify common types of staphylococci. Fisk's technique has rendered possible the identification of staphylococci in a way similar to that devised by Craigie, Brandon and Yen[4, 5, 6] for the typhoid bacillus. Wilson[7] has described a method for preparing lytic filtrates of *Staph. aureus* and by this method filtrates corresponding to 18 different bacteriophage strains were prepared by him. Also he reported on some epidemiological investigations carried out in epidemics of food poisoning and pemphigus.

We have been interested in the identification of identical strains of staphylococci causing outbreaks of food poisoning. Eleven strains of staphylococci obtained from Fisk and 76 local strains of staphylococci from various sources were tested to determine whether they were lysogenic or susceptible.

By Fisk's method, using living organisms, each staphylococcus organism was tested against the other 86 strains by growing it on tryptose agar plates and spotting the plates with the other strains. When lysis was obtained with any of the strains, the lytic and susceptible strains were transferred from the plate to 0.5 c.c. of tryptose beef infusion broth and centrifuged. The supernatant fluid containing the phage was tested with the two reacting strains to determine which was the lysogenic organism.

In this paper in order to differentiate be-

TABLE I.

SOURCE OF STAPHYLOCOCCUS ORGANISMS USED FOR BACTERIOPHAGE TYPING

Source	*Number of strain*
Fisk's cultures	1 to 11
Preoria staphlococcus	27
Pus from boil or abscess	12, 13, 15, 24, 25, 26, 28, 32, 33, 34, 35, 37, 38, 39, 40, 43, 45, 50, 51, 52, 53, 54, 57, 58, 59, 60, 63, 64, 66, 67, 68, 69, 70, 71, 77, 82, 83, 84
Eye	14, 44, 55
Throat	16, 23, 46, 79, 80, 81, 87
Urine	41, 42, 65
Fæces	20, 21, 22
Blood (Septicæmia)	30, 31, 36, 48, 49, 61, 72, 73, 74, 75, 76
Spinal fluid	47, 56, 62
Cow's milk	29, 85, 86
Foods	17, 18, 19, 78

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TABLE II.

INCIDENCE OF LYSOGENIC AND SUSCEPTIBLE STRAINS OF STAPHYLOCOCCUS AMONG 87 CULTURES ISOLATED FROM VARIOUS SOURCES

Lysogenic strain	*Susceptible strain*	*Susceptible strain*	*Lysogenic strain*
(1)	2, 59, 67, 68, 74, 75	1	(51)
(4)	86	2	(1)
(6)	16-22, 82, 85	8	(37)
(7)	59	10	(9) (11) (14)
(8)	11, 27	11	(8) (14) (33) (34) (35) (40)
(9)	10, 12, 87	12	(9) (61) (62) (72) (73)
(10)	78	14	(35)
(11)	10, 78, 82	16-22	(6) (35)
(14)	10, 78, 82	27	(8)
(15)	87	28	(61) (62) (72) (73)
(16-22)	78, 82	29	(80) (81)
(24)	87	30	(46) (64)
(29)	85	36	(40) (46) (61) (62) (64) (72) (73) (80)
(33)	11, 55, 58, 87	37	(83)
(34)	11, 87	38	(8) (79)
(35)	11, 14, 16-22, 57, 58, 82, 85	43	(64) (80)
(37)	8, 78, 82, 84	49	(64) (80)
(39)	85	52	(80)
(40)	11, 36, 87	54	(80)
(44)	59, 71, 75	55	(33) (64)
(46)	30, 36, 58, 87	56	(61) (62) (72) (73)
(49)	87	57	(35)
(50)	87	58	(33) (46) (61) (62) (64) (72) (73) (80) (84)
(51)	1		
(61)	12, 28, 36, 56, 58, 87	59	(1) (7) (44)
(62)	12, 28, 36, 56, 58, 87	63	(64) (80)
(64)	30, 36, 43, 49, 55, 58, 63, 66, 87	66	(64)
(67)	68	67	(1)
(72)	12, 28, 36, 56, 58, 87	68	(1) (67) (79)
(73)	12, 28, 36, 56, 58, 87	70	(79)
(79)	38, 67, 68, 70, 74, 75	71	(44)
(80)	29, 36, 43, 49, 52, 54, 58, 63, 86, 87	74	(1) (79)
		78	(10) (11) (14) (16-22) (37)
(81)	29, 84	81	(83)
(83)	29, 37, 81, 84, 85	82	(6) (29) (35) (39) (83)
(84)	58	84	(37) (81) (83) (85)
(85)	84	85	(6) (29) (35) (39) (83)
		86	(4)
		87	(9) (15) (24) (33) (40) (46) (49) (50) (61) (62) (64) (72) (73) (80)

( ) Brackets denote lysogenic strains.

Staphylococcic strains number 3, 5, 13, 23, 25, 26, 31, 32, 41, 42, 45, 47, 48, 53, 60, 65, 69, 75, 76, 77 were not susceptible to any of the phages and did not produce any phage for the other strains.

tween the lysogenic and susceptible strain of staphylococcus, the lysogenic strain number is placed in brackets.

In Table I the first eleven strains of staphylococci were those received from Fisk. The Preoria staphylococcus organism used as the standard for the potency of penicillin, was also included in the tests. Thirty-eight were isolated from boils, abscesses or infected wounds. Eleven cultures were from blood cultures of patients with septicæmia. There were four foods from which staphylococci had been isolated. Other strains were isolated from the throat and fæces of persons with food poisoning.

The incidence of lysogenic and susceptible strains of staphylococcus was determined in 87 cultures isolated from various sources, as shown in Table II. Phage strains 16 to 22 were identical as were phage strains 61, 62, 72 and 73. Altogether, 33 lysogenic strains were present. Among the susceptible strains, 16 to 22 were identical so that there were 38 susceptible strains present. Twenty of these staphlococci were not susceptible to any of the 33 lysogenic strains nor did they produce any phage for any of the 87 strains.

In an epidemic of food poisoning enterotoxic strains of staphylococci were isolated from the throat and fæces of patients, from vegetable salad and cooked ham. These seven staphylococci were lysed by two lysogenic types. One of these was Fisk's strain number (6). The other was a culture from a boil, number (35). These strains also produced a phage which lysed two cultures of staphylococci. One of these susceptible strains, number 78, was isolated from a cream pie and the other number 82, was isolated from an infected toe nail. All these organisms produced enterotoxin, were coagulase positive and were sensitive to .031 of a standard unit of penicillin. Culture 17 was negative for enterotoxin on the first kitten test but was positive on a second test. These staphylococci which had been isolated from the foods, patients' throat and fæces, were identical as they were lysogenic for two strains and susceptible to two others. Therefore the staphylococcus isolated from the food was the organism causing the outbreak.

In a second epidemic of food poisoning (Table IV) staphylococci were isolated from cream pie and the throats of four persons who had been ill. By the phage typing method each of these

TABLE III.

PHAGE TYPING, KITTEN TEST AND PENICILLIN SENSITIVITY TESTS ON STAPHYLOCOCCI ISOLATED FROM PATIENTS AND FOODS IN AN EPIDEMIC OF FOOD POISIONG

	Phage typing						
Source of staphylococcus	*Susceptible strain*	*Lysogenic strain*	*Lysogenic strain*	*Susceptible strain*	*Coagulase*	*Kitten test*	*Penicillin sensitivity*
Throat of patient 16	16	(6) (35)	(16)	78, 82	+	+	.031 units
Vegetable salad 17	17	(6) (35)	(17)	78, 82	+	1 pos. 1 neg.	.031 units
Vegetable salad 18	18	(6) (35)	(18)	78, 82	+	+	.031 units
Cooked ham 19	19	(6) (35)	(19)	78, 82	+	+	.031 units
Fæces, patient 1, 20	20	(6) (35)	(20)	78, 82	+	+	.031 units
Fæces, patient 2, 21	21	(6) (35)	(21)	78, 82	+	+	.031 units
Fæces, patient 3, 22	22	(6) (35)	(22)	78, 82	+	+	.031 units

TABLE IV.

PHAGE TYPING AND KITTEN TEST ON STAPHYLOCOCCI ISOLATED FROM FOOD AND THROAT OF PATIENTS IN AN EPIDEMIC OF FOOD POISONING

	Phage typing					
Source of staphylococcus	*Susceptible strain*	*Lysogenic strain*	*Lysogenic strain*	*Susceptible strain*	*Coagulase*	*Kitten test*
78 Cream Pie.....	78	(10) (11) (14) (16-22) (37)	0	0	+	—
79 Patient's throat...	0	0	(79)	36, 67, 68, 70, 74, 75	—	—
80 Patient's throat...	0	0	(80)	29, 36, 43, 48, 52, 54, 58, 63, 86, 87	—	—
81 Patient's throat...	81	(83)	(81)	29, 84	+	+
87 Patient's throat...	87	(9) (15) (24) (33) (34) (40) (46) (49) (50) (61) (62) (64) (72) (73) (80)	0	0	+	—

TABLE V.

PHAGE TYPING AND PENICILLIN SENSITIVITY OF HÆMOLYTIC STAPHYLOCOCCUS AUREUS ISOLATED AT DIFFERENT TIMES FROM THE BLOOD AND SPINAL FLUID OF THE SAME PATIENT

Source of staphylococcus	*Date specimen taken*	*Susceptible strains*	*Lysogenic strains*	*Coagulase*	*Penicillin sensitivity*
61 Blood.....	Aug. 14	12, 28, 36, 56, 58, 87	(61)	+	0.062 units
62 Spinal fluid..	Aug. 14	12, 28, 36, 56, 58, 87	(62)	+	0.062 units
72 Blood.....	Aug. 20	12, 28, 36, 56, 58, 87	(72)	+	0.062 units
73 Blood.....	Aug. 26	12, 28, 36, 56, 58, 87	(73)	+	1.0 units

strains were different. Only one of them, 81, which was isolated from a patient's throat, showed the presence of enterotoxin by the kitten test and it may have been the staphylococcus causing the intoxication. It is evident that the organism isolated from the cream pie was not the staphylococcus causing the outbreak.

It is of interest to know whether a staphylococcus isolated from the blood culture of a patient is identical with an organism found present in the blood at a later date. In Table V there is recorded the result of phage-typing and penicillin sensitivity tests performed on staphylococci isolated at different times from the same patient. It is noted that the phage from each of the staphylococci isolated from the blood and spinal fluid produced lysis of 6 other susceptible strains and in no others. They are therefore the same lysogenic strain. This lysogenic strain was not susceptible to any of the phages isolated from the 87 organisms under test.

The organism isolated on August 26 had developed a resistance to penicillin and was sensitive to 1 unit, whereas it was sensitive to 0.062 units from the blood and spinal fluid on previous dates. Had this typing method not been available there would have been some doubt whether the organism isolated on August 26 was identical to those previously isolated from the blood and spinal fluid. When this increase in resistance of the organism to penicillin was noted, a larger amount of penicillin was given intravenously and the patient recovered.

CONCLUSIONS

The identification of identical enterotoxic strains of staphylococci in food poisoning outbreaks is important in order to determine the source. This can be done by bacteriophage typing of the staphylococci isolated from food, food handlers and patients during an epidemic. By this means the infection may be traced to a carrier harbouring the offending organisms in the nose or chronic skin lesion and who has infected the food supply.

It is important to be able to prove that a staphylococcus organism isolated from the blood of a patient with septicæmia is the same as an organism isolated from the spinal fluid, abscess or other location in the same patient. Staphylococci isolated from the blood of a patient on successive blood cultures should be typed to prove that they are identical strains.

This method of phage-typing is of value in epidemics of impetigo occurring in a nursery or infant ward. The staphylococci isolated from the skin lesions can be typed and compared with those isolated from the nose or hands of nurses or attendants. The source of the epidemic may be determined in this manner.

SUMMARY

1. Eighty-seven strains of staphylococci from various sources have been typed by Fisk's method of phage typing.

2. In a food poisoning epidemic identical strains of staphylococcus were isolated from foods and sick patients.

3. Staphylococci isolated at different times from the blood and spinal fluid of a patient with septicæmia and meningitis were identical.

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THE SPLEEN.—"This member hath a propertie by itselfe sometimes, to hinder a mans running: whereupon professed runners in the race that bee troubled with the splene, have a devise to burne and wast it with an hot yron. And no marveile: for why? they say that the splene may be taken out of the bodie by way of incision, and yet the creature live neverthelesse: But if it be man or woman that is thus cut for the Splene, hee or shee looseth their laughing by the meanes. For sure it is, that untemperate laughers have alwaies great splenes."—Pliny, trans. by Philemon Holland (1601).

GENERAL ANÆSTHESIA FOR TONSILLECTOMY

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AT Rideau Military Hospital tonsillectomies and multiple tooth extractions with immediate insertion of dentures are performed under general anæsthesia. During the past 10 months about 120 cases have been done, 100 of which were tonsillectomies.

It is felt that the technique of anæsthesia and the results attained might be of interest to those who employ general anæsthesia for mouth and throat cases.

Since Rideau Military Hospital serves the Navy, Army and Air Force, these operations have been performed on men and women of the three services.

Preoperative care.—The patient is admitted the day before operation. Three injections of kavitan (vitamin K) are given, bleeding and clotting time are checked by the laboratory and the patient is examined by the anæsthetist, who orders premedication. This consists of nembutal gr. 1.5 at bedtime and a hypodermic injection of morphine and scopolamine one hour before operation, usually morphine gr. ¼ with scopolamine gr. 1/100 for men and morphine gr. 1/6 with scopolamine gr. 1/150 for women. Scopolamine is used in preference to atrophine because it inhibits secretions more thoroughly,[5] is effective longer, provides a degree of psychic sedation, and in doses of 1:25 with morphine almost entirely counteracts the respiratory depression of this narcotic.[8, 9]

Technique. — In the operating theatre the patient is placed on a table with two pillows and the head strap for the gas machine under the head. The rebreathing bag of the Heidbrink machine is three-quarters filled with 50% oxygen and nitrous oxide.

Anæsthesia is induced with 5% sodium pentothal intravenously. Three cubic centimetres are injected rapidly and, after a pause, 2 c.c. are added. With some patients, particularly women, the initial injection is sufficient, while with others nearly 10 c.c. may be needed for induction.

When the patient relaxes in sleep the facepiece is applied and the straps affixed. As the patient breathes from the bag, a flow of 50

to 60% cyclopropane in oxygen is turned on and administered, with the carbon dioxide absorber cut out of the circuit, until the eyeballs become fixed and the jaw well relaxed, usually at the end of the first plane, third stage.

The gases are turned off, the mask removed and intubation performed. A Guedel folding laryngoscope is introduced into the mouth, the tongue displaced, the epiglottis elevated and a Magill endotracheal tube, carrying a Waters inflatable cuff[7] and a Magill metal adapter, is slipped between the vocal cords into the trachea as far as necessary to carry the cuff beyond the larynx. The endotracheal catheter is connected to the gas machine with a Y connector and a short piece of heavy tube. The cuff is inflated in the trachea until gentle pressure on the rebreathing bag indicates that the fit is snug,[4] the balloon's pilot catheter is clamped, the carbon-dioxide absorber is cut into the circuit, the rubber connecting tube and the metal adapter are disconnected momentarily while the surgeon inserts the mouth gag, and the operation is begun. The surgeon's assistant, with the tongue depressor, holds the tube away from the operative site.

In the closed circuit anæsthesia is maintained with cyclopropane-oxygen, ether-oxygen or a combination of cyclopropane-ether-oxygen.

At the completion of the operation the laryngoscope is again introduced so that all blood, mucus and debris can be aspirated from the pharynx and pyriform fossæ under direct vision. The patient is hyperventilated with carbogen from the machine, the cuff is deflated and the endotracheal tube is gently withdrawn on expiration as the reflexes return. After a Guedel rubber covered airway is inserted, the patient is returned to the ward.

Position for laryngoscopy.—It is felt that direct intubation is simplified by adopting the modified position as advocated by Gillespie[3] and illustrated so well by Major Freda Bannister, R.A.M.C.[1] In essence the head is elevated on two pillows and the patient intubated in this position. Almost invariably the cords are exposed clearly and intubation is easily and rapidly performed.

Endotracheal tubes. — Portex plastic Magill endotracheal tubes described by Gordon and Ainsley[6] are used.* They are smooth, strong, flexible, do not kink and can be repeatedly boiled without deterioration. In heat they are quite flaccid. The shape is regained by holding the soft tube under cold water in the curve desired, which the tube holds until boiled again. These tubes have been used steadily for almost a year without showing adverse effects. Sizes 7, 8 and 9 fill all the requirements from the smallest woman to the largest man.

If the cuff and tube are powdered they can be quickly fitted by inserting a closed intestinal clamp inside the balloon, opening the jaws to stretch the rubber cuff, and slipping the Magill tube between the jaws into the cuff. The clamp is smoothly withdrawn.[2]

ADVANTAGES OF THE TECHNIQUE

A rapid, quiet, pleasant induction is assured. Respirations are easy and unobstructed and complete control is obtained, thus avoiding gagging, coughing, sudden lightening of anæsthesia or dangerous aspiration of blood and debris. The patient's body heat and moisture are retained and the pharynx can be cleansed of blood and the trachea of accumulated mucus before the tube is removed, thus assuring a smooth convalescence. The operator is not hurried and the anæsthetic vapour being confined to the closed circuit spares him the annoyance of breathing exhaled ether fumes. Anæsthesia can be lightened quickly and reflexes allowed partially to return before the patient leaves the theatre.

Postoperative results.—Postoperatively these patients seldom vomit and, in this series, there have been no pulmonary complications, although one woman showed signs of hysterical loss of voice for several days. No sore throats or other adverse symptoms or signs have been attributed to the presence of the inflated cuff in the trachea. This is judged by results in the many other types of cases in which the technique was used, since in tonsillectomies sore throats are the rule for a day or so.

Other applications. — Induction with pentothal, intubation under cyclopropane and maintenance with cyclopropane or ether with oxygen is, of course, applicable to any operation requiring general anæsthesia but is of particular value in head, neck, nose and throat work where a clear airway is imperative and the anæsthetist is best away from the field.

Recently a number of multiple tooth extractions with immediate insertion of dentures have been done. This anæsthesia is well liked by the

* These can be obtained from the Medical and Industrial Equipment Limited, 12 New Cavendish Street, London, W.1.

Dental Officer since he has adequate time to extract and to fashion the denture properly.

Induction and intubation can be completed and the patient ready for operation in approximately 5 to 7 minutes, although this time is lengthened occasionally when a director is needed for the tube.

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THE EFFECT OF CLOSED PLASTER TREATMENT ON THE URINARY LOSS OF NITROGEN AFTER EXPERIMENTAL BURNING*

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THE unfavourable nitrogen balance occurring after severe burns, fractures or tissue trauma has been described by such workers as Cuthbertson,[1] Lucido,[2] Browne,[3] Taylor *et al.*[4] and Co Tui and his associates.[5] The widespread use of pressure dressings and similar methods of treatment made it seem advisable to compare the effect of such treatment as regards nitrogen loss, with untreated controls.

Our interest in compression methods had been stimulated originally by the work of Glenn, Gilbert and Drinker,[6] Orr,[7] and Trueta[8] on healing after burns and other traumata. In addition to a favourable effect on healing, it was found that shock could be prevented or markedly decreased by the early application of plaster of Paris bandages to the traumatized area after experimental burns.[9, 10] It appeared that in large part this was due to the prevention of fluid loss in the burned area. However, the non-protein nitrogen rose in the blood in the bandaged animals, some visceral congestion, hæmoglobinæmia and hæmoglobinuria occurred, as in control animals, so that in spite of a decreased incidence of shock, there was evidence that general metabolic changes took place. It seemed possible however that part of the disturbance in nitrogen balance might be associated with the shock process and by preventing or alleviating it, a reduction in nitrogen loss might be obtained.

It was considered that if nitrogen metabolism was affected by pressure treatment, other than by mechanically preventing loss of nitrogenous exudate from the surface, it would be noticeable early, during the period of fluid loss. As the application of plaster immediately after burning was considered the most effective pressure treatment in experimental animals, this method was selected for trial.

METHOD

A group of 14 mongrel dogs varying in weight from 5.3 to 11 kg. were placed on normal, controlled diets sufficient to maintain body weight. After from one to four weeks a satisfactory nitrogen balance, based on the following criteria, was obtained: (1) The excretion of nitrogen over a two or three day period was approximately the same as that over another like period. A variation of one gram of nitrogen per day was allowed. (2) The nitrogen output was approximately the same as the nitrogen intake. (3) The body weight remained reasonably constant.

Total nitrogen estimations on samples from 48 or 72 hour urine collections were done in duplicate. Estimations of fæcal nitrogen were also carried out. The macro-kjeldahl method was used for all estimations of food and excreta.

Nitrogen intakes necessary to establish a balance varied from 2.8 to 6.5 grams of nitrogen per day.

For experimental purposes a 96 hour period before burning and a similar period after burning was selected. A burn covering approximately 15% of the body surface (part of all four extremities) was produced on all dogs, under anæsthesia, following the method described previously. This consisted of plunging the extremities in water at 100° C. for one minute. The extremities of seven dogs were wrapped immediately in plaster of Paris bandages, while the remaining seven constituted untreated controls. This procedure was carried out under deep sodium pentobarbital anæsthesia.

Blood non-protein nitrogen levels were taken before and after burning. Bromsulphalein tests were performed and serum phosphatase levels were obtained at least once before, and from one to three times after burning.

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RESULTS

1. The nitrogen intake and excretion of all the dogs for the 96-hour period before and after the burn are presented in tabular form (Tables I and II).

TABLE I.

NITROGEN BALANCE IN CONTROL GROUP FOR A 96 HOUR PERIOD BEFORE AND AFTER BURNING

	Before burning		*After burning*	
	Intake	*Output*	*Intake*	*Output*
Weight (Kg.)	*gm. N.*	*gm. N.*	*gm. N.*	*gm. N.*
11.1	26.12	24.00	26.12	39.19
7.0	12.96	11.90	12.96	18.80
8.6	24.54	24.90	10.25	25.54
6.0	11.52	9.80	11.52	19.30
8.4	14.25	12.36	11.33	21.36
8.3	12.94	13.94	12.94	22.13
8.5	16.20	15.58	3.96	8.61

TABLE II.

NITROGEN BALANCE IN PLASTER TREATED GROUP FOR A 96 HOUR PERIOD BEFORE AND AFTER BURNING

	Before burning		*After burning*	
	Intake	*Output*	*Intake*	*Output*
Weight (Kg.)	*gm. N.*	*gm. N.*	*gm. N.*	*gm. N.*
10.4	26.84	22.60	26.84	35.92
11.3	26.84	25.60	26.84	30.43
10.2	24.56	22.60	24.14	36.06
7.6	16.84	15.32	16.84	24.22
7.1	19.44	18.90	18.62	18.81
7.9	10.36	9.32	10.36	17.85
7.5	11.60	9.91	2.88	8.50

TABLE IV.

Before	*48 hours*	*96 hours*
Phosphatase (King Armstrong)	*Phosphatase (King Armstrong)*	*Phosphatase (King Armstrong)*
Control	Burn	Burn
6.7	14.1	19.4
7.0	...	...
12.4	40.5	...
5.5	14.7	...
10.5	38.7	...
7.6	...	110.0
10.9	...	53.4
Plaster	Burn	Burn
5.2	14.7	17.0
3.9	...	14.0
4.8	9.0	8.1
10.5	...	35.4
6.75	...	47.4
5.70	16.5	...
5.1	13.2	...

DISCUSSION

Loss of nitrogen from the body after burns starts almost immediately and continues for many weeks. Hirshfeld, Williams, Abbott, Heller and Pilling[11] have pointed out that more nitrogen can be lost in the urine after moderate or severe burns than can be replaced orally as protein without forced feeding. Protein depletion may result from the destruction of skin and underlying tissues, exudation or "weeping" from the injured surface, disturbance of general nitrogen metabolism, hæmoglobinuria, the effect of superadded infection, atrophy due to disuse, and disturbances coincident with skin grafting. Probably there are additional causes.

The results obtained in this study indicate that even when it is possible to carry out early, effective pressure treatment, an increased nitrogen intake either by oral or intravenous routes is necessary, if nitrogen "balance" is to be maintained.

TABLE III.

Male	*Control*					*Burn*		
Hours	48	96	144	216	288	48	96	144
Weight (kg.)	12.9	..	11.9	..	11.1	..	..	..
Diet (nitrogen)	13.06	13.06	13.06	19.59	19.59	13.06	13.06	13.06
Urine (c.c.s.)	160	175	260	465	375	375	515	530
Nitrogen (gm.)	5.43	4.89	6.18	12.62	12.02	11.98	18.74	20.52
Fæces (gm.)	150	285	266	339	308	94.6	..	312
Nitrogen (gm.)	2.2	3.5	3.18	4.27	6.88	2.87	..	3.9
Non-protein nitrogen (mgm. %)	..	..	..	..	82.06	99.88	..	..
Bromsulphalein (retention)	..	N	..	..	..	N	1%	1%
Phosphatase (K.A. units)	6.7	..	..	..	..	14.1	..	19.4

2. A statistical analysis shows that no significant difference exists between the nitrogen excretion of the plaster treated and control group. ($P = 0.6$).

3. Table III presents the data obtained from one dog for the experimental period. It is representative of the degree of nitrogen balance obtained and the effect of burning on it.

4. When the nitrogen excretion of all 14 dogs before the burn is compared with the nitrogen excretion after the burn, a significant difference ($P = 0.03$) can be shown to exist.

5. Although the serum phosphatase was elevated (Table IV), and slight bromsulphalein retention (1 or 2% at 20 minutes) occurred after burning, no difference between groups was noted. The same might be said of blood non-protein nitrogen, which rose in every animal regardless of treatment.

SUMMARY

1. A description of experiments designed to illustrate the effect of early compression treat-

ment on nitrogen loss occurring soon after burns has been given.

2. No significant difference in the absolute amount of nitrogen lost after closed plaster treatment compared with that lost in an untreated control group could be demonstrated. In other words, increased nitrogen loss occurred, and the non-protein nitrogen level of blood rose, in spite of treatment preventing or markedly alleviating the shock process.

3. Despite satisfactory local treatment and absence of clinical signs of shock after burns, it is clearly necessary to ensure an adequate intake of nitrogen, in order to compensate for the increased loss in the urine.

The authors appreciate and acknowledge the interest and valuable advice of Surgeon Captain C. H. Best, C.B.E., R.C.N.V.R., Director of the R.C.N. Medical Research Division and the Banting and Best Department of Medical Research.

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THE RELIEF OF PAIN IN LABOUR WITH DEMEROL

By W. D. Flatt, M.D.

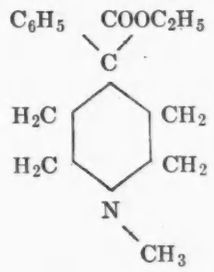
Toronto

NUMEROUS drugs and combinations of drugs have been used for the relief of pain during the first stage of labour, and up until recently no single drug or combination has been entirely satisfactory and free from danger either to the mother or the infant.

Heretofore, in order to produce satisfactory analgesia and amnesia in the mother it was often necessary to give large doses of sedatives and as a result labour was often prolonged and the infant's life was sometimes endangered. When small amounts of sedative were given labour was often very unsatisfactory to the patient herself. In other words it was very difficult to produce a satisfactory balance between the relief of pain, the degree of neonatal narcosis, and the progress of labour. It is the duty of all practising obstetricians to relieve pain as far as possible without prolonging labour or endangering mother or child.

Various workers have attempted to alleviate pain during the first stage of labour. Some have been successful in relieving practically all pain ("painless childbirth") by their procedure but as we all know, this method is not free from infant mortality; maternal mortality on the other hand has occurred with one of the more recent methods of pain relief namely, caudal analgesia. Others have published very encouraging results using a new synthetic analgesic drug called demerol, also known as dolantal, dolantin, d-140, S-140, or pethidine hydrochloride.

This drug is described as a coal tar product which was synthesized in Germany in 1939. Chemically it is known as ethylmethylphenyl piperidine carboxylate or 1 methyl-4 phenyl piperdine-4 carbonic acid ethyl ester HCl. It is soluble in water in the hydrochloride form, bitter to the taste, alkaline in reaction and low in toxicity.



DEMEROL

Piperidine compounds are analgesic. Esters of basic alcohols are antispasmodic.

PROPERTIES

It is fairly closely related chemically to atropine and morphine. It is analgesic, antispasmodic and sedative in its action, and somewhat similar to morphine combined with atropine or papaverine without their ill effects. Its morphine-like properties are: analgesia as evidenced by a marked rise in pain threshold, due in all probability to central depression, sedation and euphoria.

Its atropine-like properties are concerned with paralysis of the parasympathetic nerve endings and are as follows: Relaxation of smooth muscle

which produces paralysis of the terminations of the oculomotor nerves in the sphincter pupillæ causing dilatation of the pupils; paralysis of the terminations of the vagus nerve causing tachycardia, relaxation of the bronchi, and a definite relaxing effect upon intestinal peristalsis and uterine contractions during labour without diminishing their efficiency, and a retardation of glandular secretion.

Anticholinergic action—normally cholinesterase hydrolyzes acetylcholine to choline and acetic acid. When cholinesterase is inhibited this transition does not occur; more acetylcholine is present, and more parasympathetic effect occurs. Reflexes are thus modified in all probability by a direct action on the spinal cord.

Its papaverine-like property is the antispasmodic action on all smooth muscle which for our purpose concerns the contracting uterus. No detrimental effects on the cellular elements of the blood have been described following prolonged administration, and the danger of addiction is apparently not nearly as great as that of morphine.

The signs of overdosage are described as follows: Marked euphoria, motor restlessness, profound stupor, psychosis with confusion, myoclonic twitchings and epileptiform seizures.

Clinical Use

At the Toronto General Hospital demerol was used almost routinely on public ward patients for the relief of pain during labour from February, 1945, to June, 1945, inclusive. More than two hundred patients received the drug, for the most part intramuscularly, and to a lesser extent intravenously. Demerol was given to practically all patients in labour except those who were delivered shortly after admission and those who suffered from eclampsia or severe pre-eclampsia. Patients with mild pre-eclampsia suffered no ill effects from the drug. Patients who received the drug intravenously received immediate relief from pain and those who received it intramuscularly were relieved in from five to fifteen minutes. The duration of drug action in both instances was from one to three hours. It was given alone, in combination with hyoscine, or in combination with hyoscine and sodium amytal; 100 mgm. of the drug has been the routine dose but this was repeated at various time intervals. The amount of hyoscine and sodium amytal as well as their time interval has been variable. Changes in time interval and total amounts of drug given were studied in an attempt to obtain maximum amnesia and analgesia without producing undue excitement.

Hyoscine depresses the central nervous system and paralyzes parasympathetic nerve endings, having an atropine-like effect on smooth muscle and secreting glands. It was therefore used in our cases to further reduce uterine spasm, to produce amnesia and to increase the effect of demerol. Sodium amytal was added because of its rapid and prolonged action, because of its ability to reduce motor excitability, and to produce mild amnesia and drowsiness. It also increases the action of demerol.

The resultant effects on mother and infant were as follows in 200 cases, 90% of which were personally supervised.

Mother

Complete amnesia and complete analgesia	15 or 7.5%
Almost complete amnesia and complete analgesia	18 or 9.0%
Almost complete amnesia and almost complete analgesia	74 or 37.0%
Incomplete amnesia and almost complete analgesia	62 or 21.0%
Incomplete amnesia and incomplete analegsia	30 or 15.0%
No amnesia and no analgesia	3 or 1.5%

Infant

There were nine stillbirths in this series, or 4.5%. The cause of death and numbers were as follows: pre-eclampsia 2; syphilis 1; premature separation of a normally implanted placenta 3; prolapsed cord 1; anencephaly 1; hydrops fœtalis 1. No intrapartum fetal deaths were attributed to the sedation used.

Almost immediate respiration	141 or 73.4%
Delayed respiration	42 or 21.8%
Prolonged resuscitation	9 or 4.6%

The cases included prolonged labours, forceps deliveries, manual rotation of occiput posterior positions, face and breech presentations. Our sedation routine may have had some mild anoxic effect on the infant, because delayed respirations in the infant occurred most commonly in patients who had complete amnesia and analgesia, or almost complete amnesia and complete analgesia. Of course it is only reasonable to believe that drugs which produce maternal cerebral anoxia must also produce a certain variable degree of fetal cerebral anoxia, and naturally some drugs are greater offenders than others. There was a definite reason for each of the nine cases of prolonged resuscitation and in no instance was this directly attributed to demerol. This drug appears to cause some mild fetal anoxæmia when given in frequently repeated doses, but its degree is much less than any effective sedative thus far, and has never caused concern.

The results concerning the mother were obtained both objectively and subjectively. It was not thought advisable to depend entirely on the patient's reaction because of the great variation in mental make-ups encountered. Patients were observed closely throughout the first and second stages of labour and questioned within thirty-six hours following delivery. During June, 1945, because of the increased knowledge in administration of the drug more patients received satisfactory amnesia and analgesia. Incomplete amnesia and analgesia are usually due to insufficient dosage but the desirable effects are more certain when combined with hyoscine.

Some of the effects following administration have been the following: Nausea, vomiting, flushing, a sensation of faintness with or without sweating, dilatation of the pupils. There is usually an initial rise in blood pressure during the first half hour. After that the blood pressure is either lower or about the same as it was before the drug was given. Occasionally there is an initial fall in blood pressure (especially if the drug has been given intravenously), followed by a secondary rise, then later a fall; an increase in pulse rate as long as the drug is administered; the respiratory rate is somewhat increased during the first half hour, thence returning to normal or slightly less than normal; the mouth and throat become dry; there is complete relaxation between the pains and contractions may continue unknown to the patient.

The specific effect of demerol and hyoscine on uterine musculature varies considerably with the total drug dosage, the type of contraction, and the stage of labour. In the majority of cases the uterus still contracts rhythmically, the contractions are smoother, their onset is more gradual, they are better maintained and they disappear more slowly. They are less severe and less spasmodic in character. The frequency may be decreased for from ten to thirty minutes, but after that the frequency is the same as formerly or it may be increased. When demerol is given in adequate dosage during the second stage, labour progresses smoothly and very often no anæsthetic is required for delivery. It is possible that injuries to the soft tissues may be reduced by means of demerol analgesia, because of the orderly, rhythmic smooth progress of the presenting part. To observe one of these well sedated patients during the second stage, lying comfortably on the delivery table, unaware of the uterine contractions is to realize that no such pleasant, painless, calm progress has ever been possible with former drugs. Unlike heroin, demerol does not appear to depress uterine contractions to any appreciable degree during the first or second stages and therefore it does not prolong labour. Occasionally, when given during the second stage, contractions become more effective, the pain threshold is raised, and delivery occurs sooner and more easily than would have been the case if no sedative had been given. During hard labour demerol should be repeated frequently.

Labour is not the same in any two cases, therefore it is necessary to vary the total drug dosage and time interval with the following: Body weight and general physique, psychological and physiological make-up, type of pain (the more severe the pain the shorter the duration of drug relief), position of infant, type of labour and delivery and length of labour. It is advisable to give the sedative when labour is established and when the patient becomes uncomfortable. No other criterion was used for initial drug administration.

The most satisfactory method of sedation in our series was as follows: demerol 100 mgm., hyoscine gr. 1/150 with or without sodium amytal gr. 3, repeat demerol 100 mgm. in one hour then give demerol 100 mgm. and hyoscine gr. 1/400 every three hours or when necessary. If delivery takes place after the second injection of demerol the delivery is usually ideal for patient and obstetrician. The patient lies quietly on the delivery table, completely relaxed between pains, antispasmodic contractions continue, the birth canal is relaxed and steady orderly progress with minimum discomfort results. In many cases no anæsthetic was necessary for delivery. If anæsthetic agents are not available or if inhalation anæsthetic is contraindicated the frequent administration of demerol may be all that is required. For example the initial injection, then demerol 100 mgm. in one hour, then repeat in two additional hours if necessary. Demerol may be given either intramuscularly or intravenously. If given intravenously it should be diluted with 8 c.c. of normal saline and given slowly over a period of two minutes. It must be remembered that larger doses of sodium amytal and hyoscine than described above may predispose to infant anoxæmia of varying degrees.

The average amount of demerol given to the group was 216.5 mgm. per patient. Some pa-

tients were admitted so late in labour that time did not permit more than one injection. It is our opinion that at least 200 mgm. of demerol are necessary for a satisfactory labour. The greatest amount of demerol given to any one patient in twenty-four hours was 700 mgm. and the total amount given to any one patient was 1,000 mgm. There were two patients in the group who were very difficult to control; none of the remaining patients were unusually excitable. It would appear that demerol helps to reduce the excitement produced by hyoscine.

Operative deliveries are not increased with demerol and following delivery the patient usually recovers quite rapidly from the effects of the drug. Hyoscine in larger dosage than indicated may produce abnormal excitement, reduce frequency and duration of contractions and produce an anoxic infant. Demerol, hyoscine and sodium amytal given to patients with primary uterine inertia produces a profound soothing relaxing effect upon the patient in general and upon the uterine musculature. The patient is able to rest, but mild contractions continue.

Demerol 100 mgm. hyoscine gr. 1/100 and sodium amytal gr. 3 has been a very satisfactory preoperative sedative for Cæsarean section using spinal anæsthesia. If general anæsthesia is used it is perhaps preferable to omit the sodium amytal.

The intravenous administration of demerol is advantageous if delivery is contemplated within one hour because the patient obtains a more profound immediate effect and instantaneous analgesia. The same amount is given intramuscularly as intravenously but no more than two consecutive doses have been given intravenously to any one patient. Hyoscine if given in combination may be given intravenously, intramuscularly or subcutaneously. If given intravenously the recommended dose is gr. 1/150.

It is quite possible that single intramuscular injections of demerol could be increased quite safely in the larger patients to 150 mgm. But as mentioned previously no patient received more than 100 mgm. in any single dose and this was due in part to the size of the ampoule supplied (2 c.c. ampoule which is equal to 100 mgm.).

To obtain maximum analgesia with demerol we have found that personal supervision of its administration is very often necessary because of the diversity of reaction in different individuals, and in dissimilar types of labour.

CONCLUSIONS

Demerol is a synthetic coal tar product with atropine, morphine and papaverine-like properties, which gives satisfactory relief from pain during the first and second stages of labour. It is a safe drug, and can be given frequently. It produces excellent analgesic and sedation, and has a profound antispasmodic effect.

Its analgesic effect is enhanced by hyoscine and sodium amytal, which also produce amnesia and sedation.

The mother is given satisfactory relief from pain and fear, labour is not retarded and infant anoxæmia is reduced to a minimum.

It can be given more frequently than heroin and can be administered quite safely at any time during the first or second stages of labour.

It is of value during delivery where a general anæsthetic is contraindicated or not available.

Personal supervision of drug administration is often necessary for complete amnesia and analgesia.

Generally speaking the greatest success in providing satisfactory relief from pain during labour depends upon the brief interval between the first and second intramuscular injections.

I wish to express my deep appreciation to Professor W. A. Scott and Dr. W. G. Cosbie for their suggestions, criticisms and invaluable help during the preparation of this paper. I am also very grateful to the junior interns who so ably assisted with demerol administration.

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ORTHOPTIC TREATMENT IN CONVERGENCE INSUFFICIENCY*

By C. E. Davies, M.D.

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THE interesting part of the practice of ophthalmology is not confined to the operating room, where the surgeon extracts a lens or secures a transplant, but is also very often found in the refraction room, where judgment and experience are so important to the comfort of the patient. This is particularly applicable in the case of convergence insufficiency.

To some, the term "convergence insufficiency" may not be familiar, the condition may be better known as convergence deficiency or divergence excess. For the sake of clarity, convergence insufficiency is a weakening or failure of the normal ability of the eyes to maintain singular binocular vision of any object with fusion at working distance. It is of interest to know that the act of convergence in the normal individual is controlled by the voluntary, the sub-voluntary and the autonomic systems. I am indebted to Miss Maddox for the following analysis of this action:

> "Through the partially linked synergic action of the ciliary muscle and the interni, autonomic (accommodative) convergence is retained. The further contraction of the interni and the relaxation of the externi provides the supplementary sub-voluntary convergence, thus completing the fine adjustments necessary for focal binocular vision. Above this, we have the voluntary action governing the sub-voluntary and the autonomic systems. Convergence insufficiency is primarily a failure of the autonomic and sub-voluntary action. Where the voluntary action can provide compensation, the insufficiency will be latent. Where it fails to do so the insufficiency will be obvious."

The causes of convergence insufficiency are many, and for simplicity's sake may be divided under the headings "neuro-muscular" and "general".

Failure of autonomic and sub-voluntary convergence may be due to lack of stimulus or failure of muscular response. Accommodative or autonomic stimulus will be impaired in cases of under-corrected myopes or over-corrected hypermetropes. Fusional sub-voluntary ability will be impaired if there are functional defects of binocular vision, which depend on clear retinal images. Muscular response will be impaired if there is an increase in the tone of the externi, with a weakness in the tone of the interni producing a preponderant action of the externi.

All these factors which influence convergence will be affected by general health, conditions of work which throw extra strain on convergence, faulty posture and abnormal postural reflexes, abnormal structure of the head and orbits, and pathological conditions relative to the eyes.

Convergence insufficience may be found in: (1) *Divergence insufficiency*—where the patient has a limited diverging ability, and consequently suffers from panoramic asthenopia. (2) *Divergence excess*—where extra convergence over and above the accommodational convergence will be necessary to overcome the initial exophoria. (3) *Presbyopia*—where there has been an overcorrection for reading with total loss of stimulus from accommodation, or from too close application to work. (4) *Slight hyperphoria* associated with convergence insufficiency, usually due to a systemic disease, *e.g.*, low basal metabolic rate. (5) *Pure convergence insufficiency*, not associated with phorias.

The symptoms are fairly constant. They include inability to concentrate at reading distance, photophobia, blurring of print, headaches which may be frontal or occipital, nausea and fatigue. When the eyes must follow moving objects, as in watching a movie or driving a car, the symptoms are increased. Dr. Ida Mann mentions head retraction, sweating, and general distress as reactions when a patient is asked to converge upon an object approaching him. Some may consider that such a patient should be classified as a psycho-neurotic, but in our experience many of these cases have responded to proper treatment.

Examination by the Maddox rod and screen test may show orthophoria, exophoria or esophoria for near and distance. These tests, however, cannot be considered diagnostic of convergence insufficiency. The real test is the ability to focus on an object as it approaches the eye. The full normal convergence is approximately 70 mm. from the cornea. In testing for convergence insufficiency I repeat this test eight to twelve times consecutively. Usually the breakdown does not occur until the test has been repeated five or six times, when the patient will complain of diplopia as the object recedes. If the test is continued,

* Read before the Canadian Ophthalmological Society, Montreal, June, 1945.

the diplopia will be present even at 250 to 300 mm. This shows a poor convergence reserve, the patient relying almost entirely upon his voluntary convergence power, the involuntary and autonomic abilities which control the relaxation of the externi and the contraction of the interni, and the accommodative stimulus respectively, having been weakened or having ceased to function. This test is quick, accurate, and does not require expensive apparatus.

In testing for diplopia, if the eyes do not converge in time with the approaching test object and no diplopia is found, suppression of one eye is undoubtedly present. However, the Worth Light test is equally quick and more accurate.

This problem of deciding upon the best treatment for a patient with convergence insufficiency is not new. Considering its prevalence, one would expect to find more literature on this condition. It is found in the high school student, the stenographer, and the presbyopic banker alike. Its onset is insidious, and when undiagnosed, the patient wanders from oculist to optometrist, from chiropractor to Bates Method as advocated by Huxley—anything for relief. Unless one has actually suffered from convergence insufficiency there seems little reason to sympathize with a patient who is apparently in good health, though he may have been under considerable nervous strain spending long hours at close work, often under poor light.

The prescribing of prisms will not cure convergence insufficiency, because a dynamic dysfunction needs a dynamic cure. The amount of convergence needed as the eyes read up and down and across the book, at varying distances, varies from moment to moment. How can prisms, which create no amplitude of reserve, correct this?

Orthoptics will teach the patient to converge without accommodating, thus creating a convergence reserve. The central suppression which is usually present can also be corrected. Nowadays, as Lancaster says "the public expect to be taught how to use their eyes, and skill is not dependent upon the strength of the muscle, but upon repetition, which orthoptics provides". Those doctors who hold orthoptics in disfavour probably do so because it has so often been used by unqualified persons. An orthoptist needs sound instruction in the principles of physiology and psychology, and at least a year's clinical experience.

The Orthoptic Clinic in Vancouver was opened in 1939, with one orthoptist from the Royal Westminster Ophthalmic Hospital of London. Due to war conditions we found it necessary, in order to keep pace with the increasing work at the clinic, to train our own orthoptists. The students, who were university graduates, were given one year's course as laid down by the British Orthoptic Society. Some of the lectures were given by the surgeons, and the students had ample opportunity to visit the hospital and witness operations. We considered that the more opportunity the students had of coming in contact with the medical profession the better able they would be to appreciate the difficulties with which the surgeon was faced, and the more likely to develop a high standard of efficiency and ethics, so necessary to their profession.

We have found the following instruments to be most useful in order of their importance: synoptophore, cheiroscope, rotoscope, diploscope.

After a careful refraction and elimination of all other causes, the patient is directed to the Orthoptic Clinic, where treatment is aimed at curing suppression, which often takes the form of alternating central suppression. The anti-suppression exercises are followed by fusion and adduction training. At first the adduction is very low, with a breaking point of 10 diopters or less, with recovery points from zero to 5. Often symptoms do not disappear before a normal of 75 diopters is attained.

Before being discharged the patient is able to converge voluntarily and involuntarily to any object brought up to a near point of 70 mm. Most authorities now agree that orthoptic training consists in establishing a voluntary convergence response, and after this has been attained, the involuntary act of convergence is reinforced with an ample fusion reserve, so that convergence can be maintained for long periods of near work without fatigue.

Treatments vary from 6 to 19 visits, the oculist receiving a primary and final report, with intermediary reports where necessary, and the patient referred to the doctor for discharge.

In close co-operation with Miss Eyles of the Orthoptic Clinic, I have made a study of 150 consecutive cases of convergence insufficiency, treated by orthoptics, with their proper correc-

tions where necessary. The results, I think, are gratifying. Some of these cases had gone undiagnosed for years, and the patient had come to the conclusion that the severe headaches and eye strain could not be relieved. In some a psychoneurotic tendency had developed, which required careful handling by the orthoptist. Over 50% had less than one diopter of refractive correction, with 20/20 vision in practically all cases. Orthoptics may not be the final answer, but it offers a scientific method of approach. Progress during the treatments can be checked with measurements on the synoptophore, exclusive of symptoms.

OBSERVATIONS

1. Convergence insufficiency bears no relationship to refraction, and is not cured by correcting refractive errors, except in the cases of some under-corrected myopes and over-corrected hypermetropes.

2. The incorporation of prisms in a prescription will not constitute a cure, as prisms do not develop a convergence reserve.

3. Operation has not proved satisfactory in my experience in convergence insufficiency, as it is a functional condition. Extreme cases, however, may go on to heterophorias.

4. Convergence insufficiency is not confined to any one age group, as it may occur from 'teen age to the late fifties.

5. Subjective symptoms are fairly constant.

6. Measurements with Maddox rod and screen test are not diagnostic, as they do not indicate convergence reserve.

7. Repeated convergence on a test object is a quick and accurate test for convergence insufficiency.

8. Of all cases 70% could be called cures. The non-cures did not belong in any one group, exophoric, esophoric or orthophoric, but usually had complicating factors such as aniseikonia, physical or nervous disturbances. Cures were not obtained unless there was good fusion amplitude, with fusion reserve and good recovery point. Some people became comfortable after a few treatments and failed to report back until their symptoms returned to a lesser degree in one to three years.

9. Convergence insufficiency with esophoria was found to take the longest time because correct abduction had to be taught as well as adduction, *i.e.*, divergence insufficiency.

Our group of 150 cases showed the following:

For distance—66 or 44% were esophoric (convergence excess); 55 or 37% were exophoric (divergence excess); 29 or 20% were orthophoric.

For near—41 or 27% were esophoric (divergence insufficiency); 109 or 72% were exophoric (divergence excess).

Esophoria for near with 2 or more diopters required an average of 19 treatments. (Due to divergence insufficiency with convergence insufficiency). Exophoria with 2 or more diopters for near and distance required on the average 12 treatments. Exophorias for distance which increased for near required 8 treatments. Orthophorias averaged 5 treatments.

Some typical cases are reported in brief.

CASE 1

Presbyope.—D.E.G., aged 61, housewife. Unable to wear bifocals. Eyes tire. Pain and blurring. Symptoms for 7 or 8 years.

Muscle measurements: Orthophoric for distance; 12 exophoria for near, convergence 160 mm. Add.- 15-. Rec.- 10. Abd.- 12-. Rec.- 10. Suppression O.D.

After 10 treatments: 6 exophoria for near, convergence 80 mm. Add.- 80-. Rec.- 20-. Abd.- 12-. Rec.- 10. Wears bifocals with comfort now.

CASE 2

Exophoria.—W.H.S., aged 27, pilot. Recurrent attacks of inflammation in O.S. Difficulty with near work.

Muscle measurements: 4 prism diopters of exo. for distance, with 2 prism diopters of hyperphoria. Ten exo. for near, with 1 left hyperphoria. Convergence 250 mm. Add.- 15-. Rec.- 10. Abd.- 10- Rec.- 8. Intense suppression O.S.

After 10 treatments: 1 exo. for distance—1 hyperphoria; 2 to 4 exo. for near—1 left hyperphoria, convergence 70 mm. Add.- 90-. Rec.- 40. Abd.- 10-. Rec.- 8. Symptoms completely disappeared.

CASE 3

Esophoria.—J.M.M., Aged 29, stenographer. Sore, tired, and inflamed eyes. Intense photophobia, headaches and inability to read.

Muscle measurements: 2 esophoria for distance; 5 esophoria for near, convergence 180 mm. Add- 10-. Rec.- 5-. Abd.- 5-. Rec.- 4.

After 8 treatments: Orthophoric for distance; 2 exophoria for near, convergence 70 mm. Add.- 90-. Rec.- 30. Abd.- 10-. Rec.- 5. Has had no further symptoms.

925 W. Georgia St.

Physicians are many in title, but few in reality.—Hippocratic Canon.

It is easy to get a thousand prescriptions, but hard to get a single remedy.—Chinese Proverb.

CASE REPORTS

ENDOCARDITIS DUE TO BRUCELLA ABORTUS

By T. J. Quintin, M.D. and M. R. Stalker, M.D.

Ormstown, Que.

Brucellosis is a widely distributed disease in rural areas but is frequently overlooked as a cause of illness in the farming sections of Quebec.

In order to obtain some idea of the incidence of this disease in the Chateauguay Valley, serological examinations were made on some 800 patients as they came for ordinary medical examination. These patients were drawn largely from the Chateauguay Valley, which is predominantly a dairying district.

The serological examinations were made at the Province of Quebec Division of Laboratories. As a lower limit for a positive reaction 1:25 was used and 1:12.5 was regarded as a partial reaction. The method used was that advised by the British Medical Research Council. The figures thus obtained showed an incidence of 4.93% of positive agglutinations and 5% of partial agglutinations, making a total of 9.98%. This compares with the figures reported by Huddleson for packing house employees in Iowa of 10.77%; Lesem in San Diego (1931) 8.55% for milk handlers; and Lerch and Bentze (1933) in Breslau among milkmen 6.15%.

Clinically, brucellosis is seen in this area most frequently in its chronic manifestations of generalized weakness, increased fatigability, arthritic pains and neuropsychiatric sequelæ. The acute forms with skin eruptions, high fever, and delirium have also been seen in this district.

Brucellosis can be a cause of death. It can involve any system, but has rarely been reported as a proved cause of subacute bacterial endocarditis as it was in one case which is here reported.

A French-Canadian farmer, aged 26, was admitted to the Barrie Memorial Hospital, Ormstown, Que., on September 7, 1943, complaining of weakness, pain in the epigastrium, pain in the arms and legs and sensations of chilliness.

His past history showed no accidents or operations. In 1933, he had an illness, which, from his description, probably was rheumatic fever. There had been no history of frequent sore throats. In 1941, there had been several cases of "infectious abortion" among the cattle of his herd, and agglutination tests showed a number of positive reactors to "Bang's disease".

He had been accustomed to drink milk regularly and in large quantities. He had lost weight, 10 to 12 pounds in the previous 3 to 4 months. There was no history of urinary disturbance.

The present illness dated from December 30, 1942, when he began to complain of general weakness, fatigue and some headache. His physical examination then showed a mitral stenosis. These symptoms disappeared after about two weeks and he felt well until July, 1943, when he complained of pains in his legs. His examination at that time revealed tenderness over the calf muscles and no other positive physical findings. The blood, at this time however, gave a positive agglutination for *B. abortus*. He was not seen again until September 7, 1943, when he was admitted to hospital.

Family history.—Father, aged 60, was alive and well. Mother died at 38, carcinoma. Patient's wife and one child were healthy. There was no history of familial disease.

On admission to hospital, his temperature was 102°, pulse 100, respirations 22. He was bright and alert. There was some evidence of loss of weight. His pupils reacted to light and accommodation. Tongue was slightly coated. The chest was found to move freely and equally and was negative to percussion and auscultation. Examination of the cardio-vascular system showed a bounding pulse, collapsing in character. The artery walls were not palpable. Blood pressure 150/60. The heart was enlarged to the left and a coarse systolic murmur at the aortic area was transmitted into the vessels of the neck. There was a faint diastolic murmur in the same area. Over the mitral area there was a well localized systolic murmur present and a faint diastolic. On examination of the abdomen, an enlarged spleen was easily palpated but it was not tender. The skin and mucous membranes showed no petechiæ, and no joint involvement was found. Nothing abnormal was found in examining the central nervous system.

Blood cultures were negative at this time. He showed a mild anæmia. Urine showed one plus albumin. The agglutination for *B. abortus* was 1:250.

He was given sulfathiazole up to 4 grams per day for 3 days, but as the temperature rose to 104° under this therapy, it was discontinued. The temperature continued after this to show daily rises up to 104°. Sulfadiazine was tried with no better result.

He was discharged from hospital at his own request and was kept in bed at home under the care of his family physician, who reported on November 2, 1943, that the patient had had several severe nose bleeds and a marked hæmaturia on one occasion. He was, therefore, re-admitted to hospital that same day.

There was a striking change in the patient's general condition on this admission. He was extremely pale, waxy in appearance and showed generalized œdema. His breathing was short and he was only comfortable in a very high Fowler's position.

The retinæ showed no hæmorrhages but two small petechiæ were seen on the left palate. None was visible beneath the nails. The bases of both lungs were found to be dull on percussion and numerous coarse râles were present. The pulse was small in volume and showed occasional runs of extra systoles. Blood pressure 80/60. The heart measured 11 cm. to the left. Over the aorta there was now a "to and fro" murmur, much softer than on the previous examination. The systolic mitral murmur was also much fainter; the diastolic could not be heard. The abdomen was full, rounded, with bulging in the flanks. The liver could be palpated 5 to 6 cm. below the costal margin and the spleen 8 to 10 cm. below the left costal border. The spleen was firm and still not tender to any degree. Shifting dullness demonstrated the presence of free fluid in the abdomen. There was no costo-vertebral tenderness and the kidneys could not be palpated. The examination of the central nervous system again showed nothing remarkable.

His temperature on admission was 102°. His kidney function was poor. His œdema grew progressively worse. He was given two blood transfusions with some slight temporary improvement. Brucellin was also tried with no apparent result. He developed a

right-sided hemiplegia on the 9th day after admission. The course from then on was rapidly downhill, and he died three weeks after admission.

The laboratory findings in brief were as follows:

Urine.—Albuminuria with some red blood cells on one occasion, appeared towards the end.

Fig. 1.—Left ventricle laid open to show the sclerosed mitral valve with thickened fused chordæ tendineæ. **Fig. 2.**—Left ventricle laid open along the septum. The nodular sclerosed mitral valve is exposed and just to the left of it can be seen the bulky vegetation on the sclerosed aortic valve. The dark spots on the anterior surface of the left ventricle represent the hæmorrhagic abscesses in the subepicardium and myocardium. **Fig. 3.**—Section through dark spots shown in Fig. 2 shows the abscesses and hæmorrhages in the subepicardium and outer margin of the myocardium.

Blood.—The red cell count varied from a low of 1,930,000 to 3,590,000. Leucocytes did not go above 7,500, and the Hgb. was between 32 and 70%. The differential was not remarkable. Some hypochromia was noted.

Wassermann test was negative and the sedimentation rate was 32 and 24 mm. per hour.

Blood culture revealed *B. abortus* on two occasions. Agglutination tests for this organism were positive both before and after admission. *B. abortus* was also recovered from both the pericardial fluid and the heart blood at autopsy.

Electrocardiograms.—September 11, P.R. interval 0.14: left sided preponderance. November 9, 1943, P.R. interval 0.15 T_1 inverted, T_2 diphasic, T_4 inverted. Downward displacement of S-T interval in L_1 and L_4. Left sided preponderance.

X-ray of the lungs was negative.

POST-MORTEM FINDINGS

In summary, the findings, apart from the heart which will be described later, were as follows:

There was chronic passive congestion of the lung and abdominal viscera with bilateral hydrothorax and hydroperitoneum. The liver was moderately enlarged and the cut surface showed a typical nutmeg appearance. The spleen was about four times its normal size with multiple infarctions. The kidneys showed subacute diffuse pyelonephritis with minute abscesses.

The heart.—This showed a slight degree of enlargement of both ventricles and the left auricle. The apex posteriorly showed two brownish elevated hæmorrhagic areas 2 mm. in diameter. There was a similar lesion on the right aspect of the heart. The left border of the heart showed a circumscribed elevated mass 2.2 x 1.4 cm., brownish yellow in colour. The tricuspid valve was 11 cm. in circumference. The cusps were thickened by patchy areas of fibrosis—no mural thrombi. The pulmonary valve measured 7 cm. The cusps were thin and smooth but there were small petechiæ at the base of the left anterior cusp. The left ventricle showed a greatly thickened wall 3.5 cm. The papillary muscles were hypertrophied. The chordæ tendineæ were shortened and buttressed, particularly those of the anterior mitral cusp. Papillary muscles showed patches of brownish discoloration but no obvious softening.

On sectioning through the above-mentioned mass on the left antero-lateral ventricular wall, there was a distinct brownish area 2 x 3 mm. and another necrotic area 3 x 5 mm. In the overlying fatty tissue there were other discoloured areas seen on section. In the left coronary vein there was some thrombotic material which represented a probable thrombus. The mitral valve measured 8.5 cm. The anterior cusp was fibrosed and sclerosed at its margin. The posterior cusp was thickened. The left auricle and appendage were not remarkable. The aortic valve measured 5 cm. in circumference. The cusps were thickened. The left posterior cusp was fibrosed and presented two sclerotic plaques. The right posterior cusp was not distinguishable because of a large polypoid vegetation measuring 3 x 3 cm. which almost entirely occluded the orifice of the valve. The anterior aortic cusp was completely destroyed by vegetative growth. This vegetation in its upper portion was friable and greyish red in colour. The intima of the aorta was roughened and irregular over its surface immediately above the cusps. The vegetation projected down into the cavity of the left ventricle and extended up to and beyond the level of the sinuses of Valsalva. The coronary arteries were patent, non-sclerotic and were probed easily.

Microscopic examination (Dr. J. E. Pritchard).—The liver showed typical passive congestion. There was diffuse subacute pyelonephritis with minute abscesses. The spleen showed general hyperplasia with acute inflammatory foci in the splenic follicles and multiple infarctions caused by emboli from aortic valvular vegetations.

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Lung.—The general architecture is well maintained. There is no exudate nor are there any pigmented phagocytes in the alveoli, all of which are well aerated. A striking feature is the great accumulation of lymphocytes and larger mononuclear cells throughout the alveolar septa causing marked thickening of these structures. Here and there the pleura is also infiltrated with lymphocytes. There is an occasional small nodule of lymphocytes in the thickened parenchyma. The bronchioles are intact and show slight lymphocytic infiltration of their walls, and in the lumina are many pigmented phagocytes. One bronchial artery shows a marked subendothelial connective tissue cell hyperplasia causing a marked thickening of the wall.

A section from the left lung is similar in general to the foregoing, but in it is a 1 cm. round caseous nodule surrounded by a fibrous capsule and containing a light deposit of calcium. About this nodule there are three smaller ones about 2 cm. in diameter. One of these is attached to a bronchial and pulmonary artery. This is a typical Ghon tubercle.

SPECIAL SECTIONS OF HEART

Left ventricle.—The epicardium is swollen but the endothelial surface is intact. There is a mild infiltration with small and large mononuclear cells and there is a fibroid deposit in this swollen membrane. Myocardium shows hypertrophy of fibres. Scattered throughout are many patches of atrophy of muscle fibres leaving nuclei in a loose reticular network and in these areas are a few lymphocytes and polymorphonuclears. Another prominent feature is many foci of intense cellular exudate consisting of lymphocytes, plasma cells, large mononuclears and polymorphonuclears in variable proportions. These centre about minute vessels some of which are destroyed and some of which contain minute emboli. These are typical Bracht-Wachter lesions. In one of the septæ there is an intense focus of cells about one of the veins, extending into its wall and over this there is a marked subendothelial connective tissue cell hypertrophy and hyperplasia. At the opposite side there is a marked hyaline degeneration and swelling of the wall of the vein. Some of the septa are widened, œdematous and infiltrated lightly with lymphocytes, plasma cells and large mononuclear cells, and show some connective tissue cell hyperplasia. One artery in a septum shows a marked subendothelial connective tissue hyperplasia involving one-half of the circumference and reducing the lumen by about two-thirds. In this thickened intima there is a plaque of calcium. This is probably an old rheumatic lesion.

Left ventricle-papillary muscle.—This section shows along one margin large areas of muscle atrophy and infiltration with lymphocytes, polymorphonuclears and large mononuclears. The remainder of the section shows complete ischæmic necrosis and areas of hæmorrhage. At the boundary zone there is intense infiltration with polymorphonuclears, lymphocytes and large mononuclears. Here, too, are several foci of basophilic granular degeneration of muscle cells.

Right ventricle.—Shows a few small foci of cellular infiltration as in previous sections.

Left ventricle including aorta and aortic valve with vegetation.—The ventricle muscle shows a few foci of inflammatory cells. The subvalvular endocardium is markedly thickened and fibrosed. The aorta shows no lesion. The valve cusp is thickened and composed of dense fibrous tissue which widens out towards the edge. On it is a large platelet vegetation blending with the fibrous tissue. At the junction both in the vegetation and in the fibrous tissue, there are deposits of calcium. Along the aortic margin of the cusp there is a zone of intense cellular infiltration consisting of polymorphonuclears and lymphocytes, and beneath which the fibrous tissue is necrotic. A small vegetation is attached. At several points peripherally in the vegetation, there are abundant collections of Gram negative minute bacteria.

Vegetation from aortic valve.—This consists of a mass of platelet vegetation. Many bacteria can be seen along the periphery of the mass. There are also a few small deposits of calcium.

Left ventricle antero-lateral surface through miliary abscess in epicardium.—In the epicardium there is a 1 cm. abscess cavity lined by granulation tissue rich in cellular exudate consisting of lymphocytes, plasma cells, polymorphonuclears, large mononuclears and some phagocytes, beyond this zone there is diminishing cellular infiltration with small and large mononuclear cells and polymorphonuclears. Adjacent to this abscess there is a round bloody mass in which can be identified artery wall at the periphery in two-thirds of the circumference mycotic aneurysm. There is extensive cellular infiltration in the surrounding fat and many of the lymphatics are packed with large mononuclears. Many clumps of bacteria can be seen about the abscess. They are all Gram negative. The underlying muscle is as in the first section of the heart.

Left ventricle antero-lateral.—The myocardium shows atrophic fibrosed areas and foci of inflammatory cells as in previous section. In the subepicardium there is a large inflammatory mass into which can be traced an artery. At one end it is normal but when it enters the inflammatory mass it becomes grossly involved and much of its wall is destroyed and replaced by granulation tissue and fibrinoid exudate. Where the vessel wall is intact, it shows a marked subepithelial connective tissue cell hyperplasia, this whole inflammatory mass involving the vessel and the surrounding fat is composed of lymphocytes, plasma and large mononuclears, and many plump spindle cells and polymorphonuclears. Scattered in it are many irregular masses of basophilic material and irregular homogeneous partially eosinophilic and basophilic material, which looks like parts of the vegetation. There is a small amount of hæmosiderin in the granulation tissue and in the subepicardial fat in areas of hæmorrhage — mycotic aneurysm.

COMMENT

This is a proved case of *B. abortus* bacterial ulcerative vegetative endocarditis superimposed on old rheumatic valvular disease. The myocardial, splenic and renal lesions are in part embolic from the vegetations and in part of a more diffuse nature, the result of the bacteræmia. The pneumonitis must be considered due to *B. abortus*. There is, in addition, a non-specific hyperplasia of the splenic pulp and mesenteric lymph nodes.

Our thanks are due to Dr. Pritchard, pathologist of the Montreal General Hospital, and Dr. Prissick, bacteriologist, for help in preparing this paper.

CONGENITAL ANOMALY AND FRACTURE OF THE ATLAS: TWO CASES

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In any general hospital practice it would be unusual to be confronted with either of the conditions noted in the title, but when two such cases were admitted within ten days we felt that they were interesting enough to report.

Plaut[1, 2] has made a study of congenital anomalies of the atlas, reporting a case with a defect 1.3 cm. wide between the posterior arch and lateral masses. A similar anomaly was reported by Lawrence and Anderson, while Brown has reported a case of complete absence of the posterior arch. It would seem that, clinically, these anomalies are discovered only rarely and are seldom a cause of confusion in the diagnosis of fracture. On the other hand, Geipel noted fissures and gaps in the atlas in 35 of 1,136 spines studied.

The work of Jefferson[3] did much to dispel the belief that fractures of the atlas carry a high mortality and that they are extremely rare. He also pointed out that they usually result from force exerted on the top of the head with the spinal column fixed in neutral position, causing a bursting fracture of the atlas ring. This is commonly of the posterior arch through the groove for the vertebral artery. Our case seems satisfactorily explained on this basis. Recently Hinchey and Bickel,[4] reviewed the literature on fracture of the atlas, finding 112 cases reported to date: 50 of them were isolated fractures of the atlas. The over-all mortality in this series was 10.7%.

CASE 1

S./O., B.B.B., female, aged 24. This patient was brought to hospital shortly after being thrown from a horse. She landed heavily on the mid-dorsal region of her back and also struck the back of her head slightly. She complained mainly of stiffness and soreness of the mid-dorsal spinal musculature, but also of stiffness and pain in the sub-occipital region over the attachments of of the trapezius, sternomastoid, and splenius muscles. There was a complaint of pain along the left superior nuchal line but not definitely in the great occipital distribution. Flexion of the neck was full but terminal extension and rotation to the right were limited by pain.

X-ray of the cervical spine (Fig. 1) revealed a defect in the posterior arch of the atlas on the left side at the site of crossing of the vertebral artery. Because of the smooth edges of the defect, lack of comminution and displacement, as well as the mildness of the complaints, this was considered to be a congenital anomaly. The x-rays were sent to the consultant radiologist and a Thomas collar was applied meanwhile. The consultant confirmed the diagnosis.

At the end of one week the symptoms referable to the neck had disappeared and full painless movement was possible. This was considered to have been a sprain of the cervical muscles resulting from an attempt to protect the head when she fell on her back. Re-examination ten weeks later showed no change in the x-ray picture (Fig. 2).

CASE 2

Cpl. M.Y., female, aged 22. This girl arrived in the hospital in obvious distress, holding the head and neck rigid while supporting the face with both hands.

She gave a history of diving into shallow water one hour previously and hitting the top of her forehead heavily on the sandy bottom. At the time she felt something give in the neck and suffered severe pain in the sub-occipital region. The pain extended laterally down the neck. She was able to get out of the water, dress, and take the streetcar and bus to the hospital; but suffered considerable pain from the jolting and movement involved.

Examination showed extreme spasm of all the neck muscles; no movement was possible. She was markedly tender in the suboccipital region and slightly less tender over the spinous processes of C 3 and 4. Swallowing was not painful and there was no pain over the great occipital distribution.

X-rays showed a crack fracture of the posterior arch on the left side, and suggested that there was some

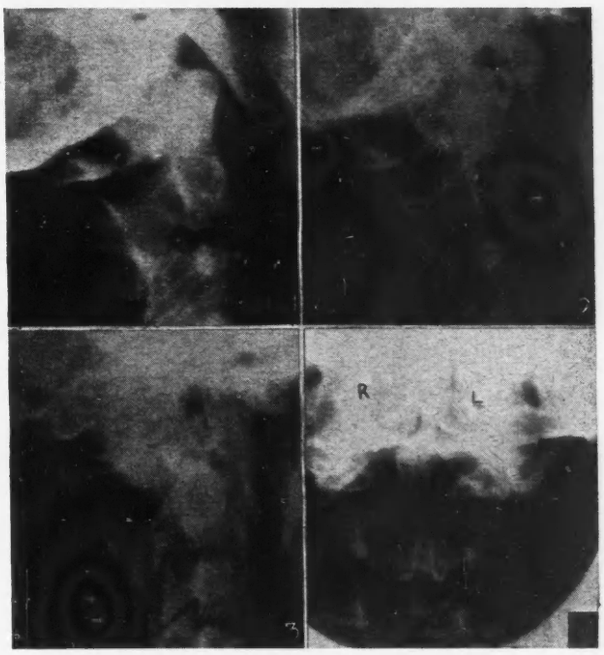

Fig. 1. (Case 1).—June 29, 1945. Defect with smooth edges, in left posterior arch of atlas. Congenital anomaly. **Fig. 2.**—Same case, September 10, 1945. No change is evident. **Fig. 3.** (Case 2).—Right lateral view, July 9, 1945. Transverse fracture line in one of posterior arches of atlas, later shown to be the right. **Fig. 4.**—Same case, same date, spot film of odontoid. Apparent narrowing of joint space between atlas and axis, on left side. Probably due to left lateral mass of atlas being "jammed down", with resultant rotation of atlas on axis.

rotation of the atlas on the axis (Figs. 3 and 4). The remainder of the cervical vertebræ were normal.

She obtained almost immediate relief from pain after being placed on a fracture bed with 4 lb. traction on a head sling. This was left on for five days. A plaster cast was then applied with the head in mid-position. She was completely comfortable in this jacket, and was sent to convalescent home for six weeks. On removal of the cast after six weeks' fixation there was no tenderness in the neck. Movement was possible, without pain, to 45° of flexion and 35° of rotation to either side, while only 5° of extension was possible. After being out of plaster for several hours she complained of weakness and aching in the neck and welcomed the application of a Thomas collar. At this time x-rays showed considerable filling in of the fracture line. She was placed in a leather collar for six weeks.

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MANIC DEPRESSIVE PSYCHOSIS (MANIC PHASE) AND ELECTROSHOCK

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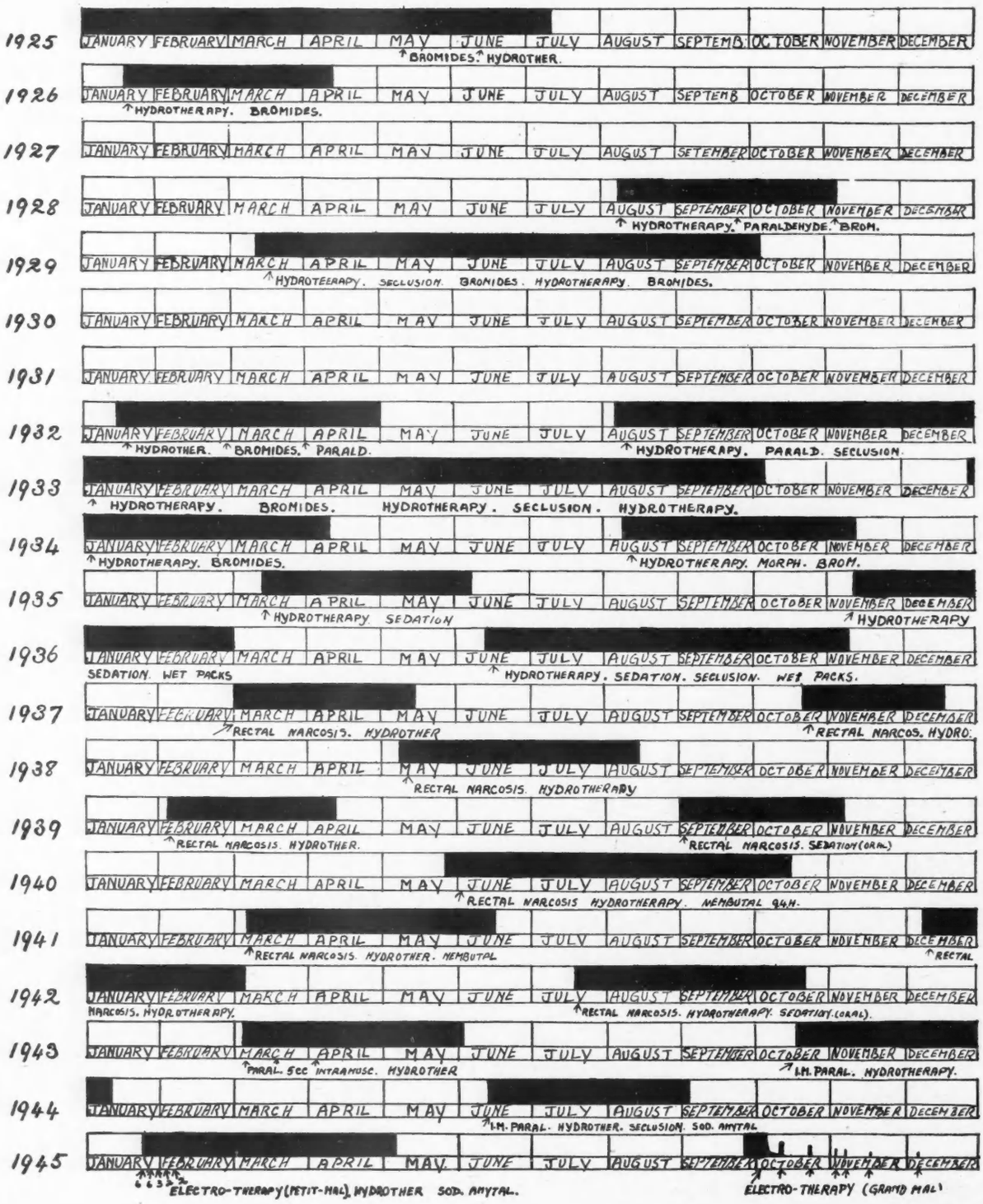
There is a difference of opinion concerning the value of electroshock in the treatment of patients exhibiting the delirium of manic depressive psychosis. The case history depicted on the accompanying twenty-year calendar may be of particular interest as it illustrates the following points most dramatically: (1) The "textbook" or "pure culture" picture of manic phase of manic depressive psychoses, *i.e.*, the periodicity of attacks, the abrupt invasion or onset, the fastigium or advance, the sharp defervescence by crisis, and the uninterrupted convalescence. (2) The effect of various therapies


1925
JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMB OCTOBER NOVEMBER DECEMBER
↑BROMIDES. ↑HYDROTHER.
1926
JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMB OCTOBER NOVEMBER DECEMBER
↑HYDROTHERAPY. BROMIDES.
1927
JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SETEMBER OCTOBER NOVEMBER DECEMBER
1928
JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER
↑HYDROTHERAPY. ↑PARALDEHYDE. ↑BROM.
1929
JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER
↑HYDROTEERAPY. SECLUSION. BROMIDES. HYDROTHERAPY. BROMIDES.
1930
JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER
1931
JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER
1932
JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER
↑HYDROTHER. ↑BROMIDES. ↑PARALD. ↑HYDROTHERAPY. PARALD. SECLUSION.
1933
JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER
↑HYDROTHERAPY. BROMIDES. HYDROTHERAPY. SECLUSION. HYDROTHERAPY.
1934
JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER
↑HYDROTHERAPY. BROMIDES. ↑HYDROTHERAPY. MORPH. BROM.
1935
JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER
↑HYDROTHERAPY. SEDATION ↑HYDROTHERAPY
1936
JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER
SEDATION. WET PACKS ↑HYDROTHERAPY. SEDATION. SECLUSION. WET PACKS.
1937
JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER
↑RECTAL NARCOSIS. HYDROTHER ↑RECTAL NARCOS. HYDRO.
1938
JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER
↑RECTAL NARCOSIS. HYDROTHERAPY
1939
JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER
↑RECTAL NARCOSIS. HYDROTHER. ↑RECTAL NARCOSIS. SEDATION (ORAL)
1940
JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER
↑RECTAL NARCOSIS HYDROTHERAPY. NEMBUTAL 9gH.
1941
JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER
↑RECTAL NARCOSIS. HYDROTHER. NEMBUTAL ↑RECTAL
1942
JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER
NARCOSIS. HYDROTHERAPY. ↑RECTAL NARCOSIS. HYDROTHERAPY. SEDATION (ORAL).
1943
JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER
↑PARAL. Sec ↑INTRAMUSC. HYDROTHER ↑I.M. PARAL. HYDROTHERAPY.
1944
JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER
↑I.M. PARAL. HYDROTHER. SECLUSION. SOD. AMYTAL
1945
JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER
↑↑↑↑↑ 6 6 3 2 2
ELECTRO-THERAPY (PETIT-MAL) HYDROTHER SOD. AMYTAL.
ELECTRO-THERAPY (GRAND MAL)

on the periodic delirious episodes during the past 20 years. (3) The effect of electroshock therapy on the patient's most recent episode of manic excitement.

J.M.M., aged 71 years; widow; first admitted to the Ontario Hospital, London, on May 8, 1925; diagnosis, manic depressive psychosis, manic phase.

Her first excitement commenced in the autumn of 1924 following an attack of typhoid fever, and ended in July 1925. Up to date she has experienced 26 episodes of manic delirium with, except for the most recent, an average duration of 3.8 months, ending abruptly with a few days of emotional instability, and followed by periods of quiescence averaging 5.8 months.

Even after a period of more than 20 years there has been no evidence of mental deterioration or defect, such as is commonly met with in longstanding or recurrent mental disorder. In the convalescent periods, the patient has been alert, neat and tidy, very much in touch with worldly affairs, and has been intelligently supervising the hospital library for long periods of time and generally conducting herself in a way comparable to those fortunate enough to be on the outside of mental institutions. No real depression in the psychiatric sense, *i.e.*, psychomotor retardation, difficulty in thinking, depression, etc., has been noted in this patient since the onset of her illness in 1924. As already mentioned she has shown depressive trends immediately following her manic attacks, when she is tearful, slightly self-accusatory on account of her recent conduct, and somewhat ashamed on account of her abnormal behaviour. These trends, however, have never continued for more than a few days.

Manic illnesses are denoted on the calendar by black rectangles, underneath which is mentioned the treatment used at the time of the attack. Rectal narcosis seemed to shorten the periods of excitement met with in 1937 and 1939, but this effect was not consistently met with in subsequent attacks, and from the calendar and clinical observation the course of the disease was essentially uninfluenced by any form of treatment until electroshock was used in 1945.

In January 1945, the patient had her 25th manic attack and electroshock therapy was considered. On account of the patient's age, it was decided to administer sub-convulsive electroshock or petit mal. From January 24, 1945 to February 5, 1945 she received a total of 19 sub-convulsive electroshock treatments with absolutely no improvement in her mental condition.

On September 25, 1945 the patient commenced her 26th and most recent manic attack. Careful physical examination again revealed that this 71-year-old patient had moderate arteriosclerosis with a blood pressure of 170/110, but otherwise was in good condition. It was therefore less hazardous to administer convulsive electrotherapy than to subject her to months of acute delirium, and accordingly "intensive" electrotherapy was commenced on October 2, 1945.

October 2, acutely excited: three electrically induced convulsions or grand mal.
October 3, less excited: two G.M.
October 4, very much less excited: two G.M.
October 5, no clinical evidence of excitement noted.

The patient's delirium was now at an end. She was transferred from the ward for acutely disturbed patients to her usual ward. Full privileges were restored to her and have not been taken from her since. She has had complete freedom of the hospital grounds and has been allowed excursions to town.

Since recovery the patient has had mild recrudescences of excitement indicating immediate electrotherapy:

October 10, some pressure of speech, slight elation: two grand mal.
October 11, much quieter: two G.M.
October 22, mild elation pressure of speech: one G.M.
October 23, less pressure of speech: one G.M.
October 24, much quieter: one G.M.
November 2, mild elation, pressure of speech, irritable: one G.M.
November 7, mild elation, pressure of speech: one G.M.
November 16, pressure of speech: one G.M.
November 17: one G.M.
December 4, elated, talkative: one G.M.

Since October 4, 1945, this patient has not presented the slightest nursing problem, and clinically has practically recovered from her 26th manic attack within nine days of the onset and within four days of receiving convulsive shock therapy.

As far as the patient is concerned she at least feels secure in knowing that as long as her physical health is satisfactory she need never be incapacitated again by episodes of excitement, and has the prospect of enjoying good mental health to the end of her life. Plans are now being considered for her rehabilitation in a suitable home where intelligent observation will be maintained. Should she show any evidence of excitement, arrangements will be made to administer electroshock at the Out-patient Department.

May 31, 1946: Very mild symptoms of irritability noted in January, March and April 1946, but were easily controlled by electroshock treatments. Patient has remained well and has full hospital privileges.

Permission to publish this case report was given by Dr. G. H. Stevenson, Superintendent, Ontario Hospital, London. Dr. Stevenson has known this patient since her first admission to hospital, and appreciation is expressed for his help in preparing the material.

PLEURAL EFFUSION ASSOCIATED WITH OVARIAN TUMOURS (MEIGS' SYNDROME)

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The syndrome of pleural effusion, ascites and ovarian tumour was described by Cullingworth as early as 1879, but it was not until 1937, when Meigs and Cass published their report of 7 cases, that the relationship of the ovarian tumour to the pleural effusion and ascites was recognized. By 1940 Meigs found 17 cases in the literature. Up to September, 1945, the writers are able to find reports of only 31 cases.

The syndrome is curious and interesting. The pathogenesis, and actual causative factor or factors, of the effusions are not at all understood. It is well established that ovarian tumours of certain types (very predominantly

fibroma) are capable of producing pleural effusion and ascites and that removal of the tumour will lead to complete cure of the condition.

The cases present themselves with symptoms suggestive of disease of the chest rather than disease of the pelvic or abdominal organs. Usually the first symptom complained of is breathlessness and a tightness of the chest. On examination, a massive pleural effusion is found, and, if unilateral, practically always on the right side. On further examination, a less marked ascites will be discovered, and if the examination is complete, or the syndrome thought of, the ovarian tumour is *usually* to be felt. If not felt on the first examination, it should be looked for repeatedly for it may have a long pedicle and thus be situated in the abdomen and not found in the pelvis.

It is probably not as infrequent as the literature would indicate. Doubtlessly many have died with a mistaken diagnosis of inoperable carcinoma of the abdomen or thorax, where simple removal of a benign ovarian tumour would have saved their lives.

The symptoms recorded in the various cases reported are, in order of their importance: breathlessness; feeling of tightness in the chest; occasional chest pain; occasional dry cough; vague gastro-intestinal symptoms—mostly epigastric distress after eating, and "gas". Some cases have complained of nausea; abdominal swelling; diarrhœa—a complaint in a few cases; swelling of the legs.

The physical signs of note are: evidence of pleural effusion (usually massive and generally in the right chest); evidence of ascites; freely movable, pelvic or abdominal, tumour.

The character of the fluid is important. It is a sterile transudate with a specific gravity ranging from 1.012 to 1.018; usually of a clear amber colour. The pleural fluid tends to rapidly accumulate in large amounts, requiring more frequent aspirations than effusions of other etiology. Our own case required aspiration daily of an amount varying from 1,000 to 1,700 c.c. The associated ascitic fluid, however, is less in amount and does not require as frequent aspiration. It is often not necessary to aspirate the abdominal fluid at all.

The condition is most common between the ages of forty and sixty, the majority occurring after the menopause. The extremes of age reported are thirty-three and seventy-five years. Marital status, sterility or fertility do not appear to be factors. Cases have occurred in those who have borne children and those who have not.

The right and left ovary are about equally affected and in a few cases the disease is bilateral. The pathology of the ovarian tumour, with the exception of two cases, has been reported as benign fibroma. Mendel, Eori, Thorne and Curtis observed the syndrome in a case of thecoma of the ovary and Townsend in a case of multilocular papillary cystadenocarcinoma.

Mrs. H.A.F., aged 61. Married. Admitted July 23, 1945. Children: alive 5; dead 1. Menopause at 51.

Complaints: cough, shortness of breath, and weakness.

History of present illness.—The patient stated that she had been perfectly well until five weeks before admission, when she first noted a shortness of breath present both on slight exertion and rest. This progressed to the point of marked dyspnœa. Accompanying it she had spasms of a dry, croup like cough, but no sputum. She had also complained of a vague epigastric distress mostly after meals with a feeling of "gas" in the abdomen. There was occasional nausea and lack of appetite. She had always been well and strong, and until the onset of the present illness had had no serious trouble. There were no symptoms referable to any of the systems.

Examination showed the following points of note: (1) Patient acutely short of breath, but not cyanotic. (2) Extremely obese with a very large pendulous abdomen. (3) Evidence of massive pleural effusion on the right with marked shift of the heart and mediastinum to the left.

No other important points were made out in the initial examination. In particular no free fluid could be demonstrated in the abdomen and no abdominal mass was felt. At the time of the initial pelvic examination, no pelvic tumour was felt. Both the abdominal and pelvic examinations were difficult, due to the thick and pendulous abdominal wall.

The chest was immediately aspirated: 2,600 c.c. of slightly turbid fluid was removed and 600 c.c. of air replaced. This, of course, gave considerable relief.

The laboratory findings were not helpful. The urine showed no abnormality except a low specific gravity of 1.008. Red blood cells 5,180,000; white blood cells 10,700; Hgb. 85%; colour index 0.82; polymorphonuclears 73%; lymphocytes 27%; Schilling: basophiles 1%; stabs. 20%; segs. 52%; lymphocytes 25%; monocytes 2%. Blood chemistry: non-protein nitrogen 24; urea nitrogen 11.2; uric acid 3.2; creatinine 1.3; sugar 80. These were repeated at later dates with comparable findings.

Admission chest x-ray.—Marked displacement of the heart and mediastinum to the left. Moderate increase in hilar and broncho-vascular markings on the left. No evidence of parenchymal disease of the left lung. The right chest entirely obscured by a massive, diffuse, impenetrable area of increased density. Diaphragm not visualized. Massive pleural effusion, right chest.

A complete gastro-intestinal series failed to show any definite evidence of disease of the gastro-intestinal tract.

Pleural fluid examination.—Slightly turbid. Stained smears showed some red blood cells, lymphocytes and some normoblasts and mesothelial cells. No malignant cells found and no cells were detected showing a raised nucleolus-nucleus ratio. Cultures were set up both for pyogenic bacteria and tubercle bacilli. These were later reported as containing no growth. Repeated examinations of the fluid failed to show any marked differences.

The chest fluid rapidly re-accumulated after each aspiration and it was soon apparent that if she were to be kept comfortable, daily aspirations were required. Between 1,000 and 1,700 c.c. were withdrawn daily.

The total amount aspirated from admission to November 8, 1945, being 107,680 c.c.

A peculiar thing was noted on July 30, 1945. The pleural pressure before aspiration was 0 + 6. After removal of 2,000 c.c. of fluid and without air replacement the pressure was still 0 + 6 and x-ray showed total collapse of the lung. This indicated pulmonary-pleural fistula. During this initial stage similar findings were noted with subsequent aspirations and the lung could not be re-expanded.

The chest was completely aspirated and a thoracoscopic examination done on August 6, 1945, with the following operative report:

Scope introduced into the fifth space in the post-axillary line and the interior of the chest observed. There was about a 90% collapse of the lung. The parietal pleura was only slightly thickened, but markedly inflamed and red. The surface of the lung and visceral pleura appeared quite healthy. No tubercles or growth seen on the surface of the lung or parietal pleura. The collapsed lung was not atelectatic as it expanded and contracted with respiration and did not have the external appearance of atelectasis. On the lateral surface of the lower lobe, there was a very large and thin emphysematous bleb which probably accounted for the leak. A considerable amount of effusion remained.

The thoracoscopic examination was repeated on September 17, 1945, with similar findings except the lung bleb had disappeared. By this time it was possible to control intrapleural pressures. On this examination also, it was noted that there were three large discrete mediastinal glands situated posteriorly and above the lung root. Neither bronchoscopic nor lipiodol examinations were carried out as ordinary flat plates after aspiration and lung re-expansion failed to show any evidence of intrapulmonary disease.

Her weight and strength were maintained by the giving of amino-acids in addition to her regular diet. The protein loss in the very large amount of fluid was quite considerable.

By October 1, it became apparent that there was a small amount of free fluid in the abdomen which increased to the time of her operation, but never required aspiration. About this time she also began to have some œdema of the feet and ankles. This also increased up to the time of her operation.

Although repeated examinations were made of the abdomen, it was not until October 31,—one hundred days after her admission—that a mass was felt within the abdomen. This was discovered by ballotting. This mass was felt in the epigastric region, just above and a little to the right of the umbilicus. The next day the mass could not be felt. A repeat pelvic examination failed to show any evidence of a tumour in the pelvis, due, no doubt, to its slipping above the examining hands.

The abdomen was carefully re-examined on November 7, with the patient in the semi-reclining position. The same ballottable mass was noted as on October 31. The position of the patient was the same as on that date, namely, about a twenty degree incline on the bed. The mass was felt to be hard and freely movable. It felt smooth and round and about the size of a grapefruit. On this examination it was felt in the same position as before. It was also noted that due to the very pendulous abdomen, the umbilicus was situated below the iliac spines and in fact below the symphysis pubis. Due to this, it was concluded that the tumour could be pelvic rather than upper abdominal.

The pelvic examination was repeated by one of us (T.A.K.) and on this examination it was found that the tumour could be easily pushed into the pelvis and felt *per vaginam*.

A diagnosis of Meigs' syndrome was finally made and a large solid, right ovarian tumour the size of a grapefruit removed on November 10.

Pathologically, the tumour was both grossly and histologically, a typical hard fibroma with a central area of hæmorrhage and a little necrosis.

The postoperative course was entirely uneventful. Several remarkable changes occurred. Her epigastric distress disappeared. Her urinary output increased tremendously practically from the time she returned from the operating room. The urine became very irritating to her, in spite of no apparent chemical or microscopic changes. The œdema of the legs rapidly disappeared and there was no re-accumulation of fluid in the abdomen. She required no further aspirations of the chest, in spite of the fact that the daily amount aspirated for some weeks just before operation averaged approximately 1,500 c.c. daily.

The fluid in the chest rapidly disappeared and the lung re-expanded. She was discharged from the hospital fifteen days after operation and has remained perfectly well since. She remained in hospital 125 days due to the failure to discover the tumour, in spite of the fact that Meigs' syndrome was suggested as a possible diagnosis soon after her admission and early investigation.

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SPECIAL ARTICLE

THE CLINICAL IMPORTANCE OF ANTIGENIC DIFFERENCES IN HUMAN BLOOD

By Philip Greey, M.D.*

In the past few years remarkable progress has been made toward a more detailed knowledge of the blood groups of man. The four classical groups of Landsteiner, so well known, have been added to as serological studies revealed the presence of previously undescribed characteristic components of human red blood cells. At the present time 288 varieties[1] are readily recognizable, while with the use of rarer reagents more than 1,000 can be distinguished. As further reagents are discovered human blood may well become as individually characteristic

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as are finger prints. To practising physicians these researches, with the complexity of nomenclature used, were for a time no more likely to arouse interest than was the division of the pneumococci into forty or more types, or the paratyphoid group of bacilli into well over one hundred.

It is now, however, abundantly clear that the immunological aspects of this new knowledge have some very important clinical applications. In the first place they explain many hæmolytic transfusion reactions for which in the past no cause could be discovered. Secondly, they establish that certain kinds of fetal morbidity are due to hereditary differences in the blood of the father and mother, and finally the different varieties of blood now recognizable provide improved means for establishing non-paternity in court cases.

The general principles underlying the new developments in this field are not difficult to understand. The present paper is written with the hope of presenting the subject in a manner which will be useful for the general practitioner. Those who are skilled in the intricacies of the blood groups need read no further.

In order that the basic immunological principles underlying the clinical significance of the different varieties of human blood may be clearly understood it is necessary to explain a few scientific terms. The word "antigen" used in a strict sense designates a protein-chemical substance which on injection into an animal causes the cells of the animal to produce antibodies. The formation of antibodies following the injection of a foreign antigen is spoken of as an immune response (*i.e.*, immunization). The antibodies formed correspond to and react specifically with the responsible antigen. If the antigenic substance is part of the structure of an intact body cell, the reaction between antigen and antibody disturbs the structure of the cell and in the case of the red blood cells brings about hæmolysis or causes them to agglutinate. But if the reaction is between an antigen in solution and the soluble antibody in the serum, the visible result is a precipitate. The antigens of human red cells are known as agglutinogens and their corresponding antibodies, found in the blood serum, as agglutinins.

The term "isoimmunization" means immunization within the same mammalian species by antigens which occur as natural constituents in some individuals of that race. In the case of the blood groups isoimmunization can occur in man only when the red cells of a person lack a certain human antigen. If that particular antigen is introduced into the blood stream of the deficient individual, his body can produce isoantibodies as a reaction to it because it is a substance foreign to that individual. If these react with red cells and cause agglutination they are called immune isoagglutinins to distinguish them from those natural agglutinins which develop shortly after birth. The use of the term "immunization" for a process which may lead to harmful effects on people or their offspring may seem strange to medical men who are accustomed to thinking of immunization as a protective mechanism: The phrase, however, is not used in that sense but in accordance with serological terminology. Some writers prefer "sensitization" to "immunization".

The intravascular hæmolysis of the red cells of a fetus, or newborn child, due to an antibody-antigen reaction, leads to what is spoken of as hæmolytic disease. The pathological changes in this condition vary considerably, depending upon the degree and duration of red cell destruction and regeneration, commonly evidenced by an increase of erythroblasts in the circulation. "Hæmolytic disease of the fetus and newborn" includes hydrops fœtalis, icterus gravis neonatorum and hæmolytic anæmia of the newborn. Diamond, Blackfan and Baty[2] in 1932 suggested that these seemingly different conditions named after the chief presenting symptom, were but manifestations of the same disease process. Since that time "erythroblastosis fœtalis" has been used to include any of the three main clinical manifestations, but because of the now accepted etiology of this condition the term "hæmolytic disease of the newborn" is to be preferred, although it is longer, as it defines the condition more clearly.

ISOIMMUNIZATION DUE TO RED-CELL-ANTIGENS

There are two ways by which isoimmunization may occur. In the first instance, people of both sexes may be made to produce isoantibodies by the transfusion of blood containing an antigen which is not present in the individual transfused. When another transfusion of blood containing the same antigen is given to such people, after the isoantibody has been formed, an antigen-antibody reaction results, ending in the destruction of the transfused red cells (hæmolytic transfusion reaction).

The second possibility occurs when a woman bears a fetus whose cells similarly contain an antigen not possessed by her. The antigen of the fetal cells escaping into the maternal circulation stimulates the mother's body to make isoantibodies corresponding to the antigen. Stimulation of the mother to make isoantibodies does not necessarily depend upon fetal red cells passing the placental barrier intact but upon the passage of the foreign fetal antigen either in solution or in fine suspension. The reverse process of the fetus making isoantibodies in response to a maternal antigen does not occur because fetal cells being immature are unable, so far as we know, to produce antibodies.

Two things may result from the formation of maternal isoantibodies: (1) they may pass the placenta in a manner similar to other antibodies and destroy the red cells which led to their formation producing hæmolytic disease

of the fetus or (2) should a transfusion of blood containing the same antigen as the fetus be given the mother, the isoantibodies in her circulation will destroy the transfused red cells leading to a hæmolytic transfusion reaction. In the latter case the reaction can follow a *first* transfusion of blood.

The specific nature of an individual's blood is determined by the antigens present in his red cells. Those known, at the present time, comprise four distinct divisions and are inherited independently of each other. Antibodies corresponding to some of the red-cell-antigens may or may not be found as natural antibodies in normal human serum. If they do not occur naturally they may be formed by an immune response in persons whose cells lack one of the red-cell-antigens. The fact that this occurs indicates that the responsible substance is really antigenic in man. Some red-cell-antigens, however, seem to have no power to induce antibody formation in man but that they actually are antigens is proved by the fact that antibodies are produced when they are injected into animals. The relative importance of each of the red-cell-antigens in the causation of hæmolytic disease of the newborn and transfusion reactions depends upon how readily they call out antibody production in man. It will be from this point of view that we will discuss the various red-cell-antigens that have already been discovered.

BLOOD GROUPS AND TYPES

I. *A-B-O series.*—The first scientific evidence that there are differences in human blood was the discovery in 1901 of the A-B-O antigens. From this we have the four classic groups of Landsteiner[3] O, A, B and AB corresponding to the numberings 1, 2, 3 and 4 of Jansky and 4, 2, 3 and 1 of Moss. These blood groups* are also characterized by the occurrence of natural isoagglutinins in the serum or plasma. Each person's serum contains anti-A or anti-B agglutinin in accordance with Landsteiner's rule that those agglutinins and only those will be found in a serum for which there is no corresponding agglutinogen in the red blood cells.

It is now generally recognized that the A agglutinogen is not a single substance but should be divided into the subgroups A_1 and A_2.[4] This division permits six blood groups, O, A_1, A_2, B, A_1B and A_2B to be distinguished. These antigenic properties which occur in nearly all the cells and secretions of most individuals as well as in their erythrocytes are inherited in accordance with Mendel's laws. It is perhaps of interest in passing to mention that in monkeys and probably in gorillas the group-substances appear to be limited practically to the tissues and secretions and are absent from the erythrocytes.

Several observations demonstrate that the O, A_1, A_2 and B substances are antigenic for humans. Jonsson[5] showed that mothers could be isoimmunized by the A and B antigens present in the fetus. Wiener[6] and Mollison and Young[7] established that the unintentional transfusion of incompatible blood was followed by a marked production of immune isoagglutinins in response to the foreign A or B antigen in the transfused cells. A similar response has been shown to follow transfusions of plasma[8, 9] and even a single small intravenous injection of highly purified A or B substance.[10] It is a general practice to transfuse Group A patients with blood from Group A donors selected without consideration of the subgroups and harmful results are seldom encountered. However, Wiener[6] has demonstrated that in certain rare individuals, the antigenic difference between A_1 and A_2 has led to isoimmunization. In one instance an A_2 individual was isoimmunized by a transfusion of A_1 blood, while in another the source was a fetus *in utero*. The response to the antigenic stimulus was the production of a corresponding immune isoagglutinin to a level sufficiently high so that had another transfusion of A_1 blood been given at the peak of antibody production, a hæmolytic reaction would most likely have resulted. Such an untoward event would be prevented by the insistence on cross-matching tests prior to every transfusion, for in the two cases cited by Wiener difficulty was encountered in finding a Group A donor whose blood was compatible in such cross tests. Evidence has also been published[11] that the transfusion of Group O blood into Group A_1B individuals can stimulate the formation of immune anti-O isoantibodies.

Since the work referred to above clearly shows that the group-specific substances of the A-B-O series are very good antigens for man, it is only natural to inquire as to why they are not one of the main causes of hæmolytic disease of the newborn. Blood group incompatibility between mother and fetus (heterospecific pregnancy) occurs quite frequently, as, for example, when the mother is Group O and the fetus is group A. In this instance the mother's serum contains natural anti-A and anti-B agglutinins of which anti-A is incompatible with the Group A substance in the fetal red cells and might well lead to their destruction. The idea that this kind of heterospecific pregnancy could cause disease was supported by the observation that the A and B antigens develop early in fetal life, that the titre of agglutinin in the mother's blood frequently rises when incompatible with an agglutinogen in the fetal blood, and the known fact that antibodies such as diphtheria antitoxin can pass through the human placenta. According to Levine *et al.*[12] the reason that the A and B

* The term "group" is usually restricted to the divisions determined by the A-B-O series of antigens while those dependent upon other red-cell-antigens are called "types".

substances are not a major cause of hæmolytic disease of the newborn is that they are not confined to fetal red blood cells, but are present in many people (called "secretors") in the body cells as well as in the body fluids. This widely distributed antigen immediately binds an incompatible maternal anti-A or anti-B agglutinin and the fetal red blood cells are thus protected from hæmolysis. However, it should be noted that some 15% of people of groups A, B and AB do not secrete the respective antigenic substances in their saliva and body fluids and are known as "non-secretors". Infants of the "non-secretor" type therefore would not be afforded the protection of the group-specific substance in their plasma. If the latter was the sole protective factor involved, a much higher incidence of hæmolytic disease due to an A-B-O incompatibility would be expected than actually occurs and, furthermore, Wiener[13] has described the disease in infants who were "secretors".

Tovey[14] has pointed out that other factors, as well as neutralization of incompatible anti-A or anti-B agglutinins by the corresponding group-specific substance in fetal plasma, contribute to protecting the infant in a heterospecific blood group pregnancy. The strength of anti-A or anti-B agglutinins crossing the placenta was found to be greatly reduced compared with that in the maternal circulation indicating that the placenta serves as a definite, if only partial, barrier to these agglutinins. Furthermore, fetal erythrocytes are considerably less sensitive to an incompatible anti-A or anti-B agglutinin than are the red cells of adults. The anti-A and anti-B agglutinins have less activity at body temperature than at room temperature.

Perhaps a combination of the factors mentioned above protects the fetus in nearly all instances during pregnancy when an incompatibility involving the A-B substances exists, but the full explanation may be even more complicated. In some cases in which the maternal anti-A or anti-B agglutinin reached exceptional strength it appeared to be the cause of the hæmolytic disease in the fetus.[13, 15, 16, 17]

II. *The M-N series.* — Additional antigenic properties, unrelated to the A and B substances, were discovered by Landsteiner and Levine.[18] Two of these factors they designated M and N. Three distinct types of human blood can be distinguished: type M (possessing M but lacking N), type N (possessing N but lacking M) and type MN (possessing both M and N). It is, therefore, theoretically possible for a person of type N to be isoimmunized by the M antigen and for the converse to occur, but isoimmunization of type MN people cannot occur because both antigens are already present in their red cells.

These three types taken in conjunction with the six groups just described permits 18 divisions of human blood to be distinguished.

Antibodies for determining the M-N types are made by injecting appropriate red cells into rabbits. While the M-N substances are antigenic for animals they possess very little power to induce antibodies in humans. From all the world only nine human sera have been recorded as containing anti-M agglutinins. In six instances they appeared to be natural agglutinins and in the remaining three they arose from isoimmunization by blood transfusion.[19, 20, 21] So far no proved cases of anti-N agglutinins natural or immune, have been recorded in the literature. The anti-M agglutinins found in human sera although more active in the cold give sufficiently strong reactions at room temperature for their detection by means of the usual cross-matching tests on slides.

The actual incidence of unusual agglutinins, such as anti-M, may be higher than indicated above. Except in the larger centres if a donor of the same blood group is not found suitable when his blood is cross-matched with that of the patient other donors are tested until a compatible one is found, but the cause of the difficulty is seldom ascertained.

III. *The factor P.*—This agglutinogen was also discovered by Landsteiner and Levine.[18] Of the white population three-quarters possess the agglutinogen P (P positive) the remainder are P negative. Consequently two additional divisions of human blood are determined through the P antigen increasing the number distinguishable from 18 to 36.

Three cases demonstrating the development of fairly strong anti-P agglutinins following transfusions have been recorded[22] and other instances have been mentioned but not described in detail.[23] The reactions given by the anti-P agglutinin are generally sufficiently strong to be detected in tests conducted at room temperature. Indeed it has been the difficulty in finding a suitable donor of the homologous blood group which led to the special investigation of the cases.

IV. *The Rh factor.*—The Rh or Rhesus factor was discovered in 1940 by Landsteiner and Wiener[24] by means of an immune serum obtained from rabbits injected with red blood cells of Rhesus monkeys. The Rh factor is present, independently of the other blood group substances, in the red cells of 87% of the white population (Rh positive) while the remainder lack it and are Rh negative. At first the Rh factor was thought to be a simple antigen but through the brilliant work of Wiener[1, 13, 25] in the U.S.A. and Race in Great Britain, and their colleagues[26, 27, 28, 29] the complex nature of the factor has been elucidated. Six Rh antigens are recognized at the present time, for which five of the corresponding antibodies have been found. Due to the existence of different Rh antigens it is possible for an Rh-positive person who possesses only one of the antigens to be isoimmunized, through transfusions or pregnancy, by

any of the others. According to Wiener's[1] classification there are eight Rh types. There has been no general agreement on the terminology to be used for the designation of these and it is unnecessary for the purpose of this discussion to describe the Rh types or their inheritance in detail.

It was pointed out earlier that the substances A-B-O, M-N and P gave 36 divisions of human blood. When this figure is multiplied by Wiener's eight Rh blood types the total becomes 288. This number can be still further increased through the use of human sera containing rarer antibodies and by tests for "secretors" and "non-secretors". To illustrate how the frequency of these 288 varieties varies in the general population Wiener[1] estimated that the most common combinations among white people would be group O, type MN, P positive and type Rh_1 with a frequency of 8.7 per cent. The rarest combination would be group A_2B, type N, P negative and type Rh′ Rh″ with a frequency of less than 1 in 10 millions. The incidence of the Rh types also varies markedly in different races and is of anthropological interest. For example, the incidence of type Rh negative is 1% or less among American Indians and the Chinese in contrast to 13% among white people, while for type Rho it is approximately 2% for whites and 41% for Negroes.[1]

Just as the Rh substance is complex so are the antibodies that are formed in response to it. The blood serum of a person isoimmunized to Rh will give, depending upon the particular antigen involved, from 30 to over 90% positive reactions with red cells from white people. If an endeavour is being made to demonstrate anti-Rh agglutinins it is of practical importance that a sufficient number of blood specimens be tested against the serum to overcome the possibility of agglutination occurring in only one sample out of three. Other human sera contains a mixture of two anti-Rh agglutinins while in still others there are what are called "blocking" or "incomplete" Rh antibodies.[30, 31] The latter have the capacity of combining with Rh-positive cells but do not produce a visible agglutination reaction. The "blocking" or "incomplete" antibodies appear to be far more important than agglutinins in the pathogenesis of hæmolytic disease and often are the only isoantibodies found in the serum of people highly immunized to Rh. This means that the blood sera of those people who are most likely to be delivered of a stillborn child or suffer a severe hæmolytic reaction if Rh-positive blood is transfused, give negative reactions when tested by the procedures usually used to demonstrate agglutination. A different technical procedure must be employed for the determination of the presence of "blocking antibodies". These difficulties of *in vitro* tests have recently been clarified to a considerable extent and with the latest techniques it may be possible for small hospital laboratories, whose staff are not expert in tests for Rh, often to detect the presence of isoantibodies which otherwise would have been missed.* But even with these and with trained personnel the laboratory demonstration of incompatibility may be difficult. The clinician, alert to the immediate signs and symptoms of a hæmolytic transfusion reaction, may still save the life of his patient by stopping the administration of blood which apparently was compatible in laboratory tests.

Shortly after the discovery of the Rh factor four transfusion reactions due to Rh incompatibility were recorded by Wiener and Peters[36] and the next year a further ten cases[37] were reported. Subsequent work has borne out the great importance of the Rh factor as a cause of hæmolytic reactions following transfusions of blood of the same group. Prior to 1941 the etiology of hæmolytic disease of the newborn and fetus remained unknown but the seed of isoimmunization had already taken root. One year before the Rh factor was described, isoimmunization by a fetal antigen had been suggested by Levine and Stetson[38] to explain a hæmolytic transfusion reaction occurring in a post-partum woman given blood of the same group from her husband. The final proof of the importance of the Rh factor in the causation of hæmolytic disease of the newborn was provided by Levine, Burnham, Katzin and Vogel.[12] In a study of 153 mothers who had been delivered of infants with hæmolytic disease they found 93% to be Rh negative in contrast to 15% in a random sample of the population. The theory that hæmolytic disease of the newborn is due to isoimmunization of the mother resulting from an antigen inherited by the fetus from the father is now thoroughly established as a fact. The most important antigens involved are the Rh factors.

The flood of light which the discovery of the Rh factor shed on the causation of hæmolytic transfusion reactions and hæmolytic disease of the newborn naturally leads one to wonder why it was not found sooner. Probably the principal reason for this is that the glass slide technique, so commonly used for compatibility tests prior to blood transfusion, fails, except in the most unusual cases, to demonstrate Rh antibodies. A special technique using small test tubes was employed by Wiener for this purpose. Even this technique, which employed the phenomenon of agglutination, not infrequently failed to detect the antibodies. For these reasons it is understandable why incompatibility due to Rh isoantibodies was not found even though an intra-group hæmolytic transfusion reaction had occurred. Similar reasons explain the failure to link earlier the

* Those interested in the technical aspects are referred to references 30, 31, 32, 33, 34, 35.

Rh factor with hæmolytic disease of the newborn. Before isoimmunization could be clearly established the antigen had to be defined and appropriate procedures worked out to demonstrate the interaction between it and its corresponding antibody.

Another deterrent to the earlier recognition of Rh was the lack of clinical material. Intragroup hæmolytic transfusion reactions are not very common, neither is hæmolytic disease of the newborn. It has been estimated[13] that only about 1 of 25 Rh-negative individuals becomes immunized through the transfusion of Rh-positive blood, for the ability of people to respond to Rh antigens varies widely. Some may do so after one transfusion or during the first pregnancy, some after two or three, while others may require many. The reason for this difference is not clearly understood. Some idea of the incidence of Rh isoimmunization to be encountered in a general transfusion service was given by De Gowin.[39] He studied the reactions following 5,386 consecutive blood transfusions administered without regard to Rh type or to the obstetrical history of female patients. Many of the recipients received multiple transfusions. There were 186 reactions of all kinds but only six were considered to be due to Rh isoimmunization. Four of the latter were attributed to multiple transfusions (four or more) and there was one fatal reaction. Although isoimmunization leading to serious clinical manifestations is thus not very common, more sensitive methods of testing for Rh isoantibodies may show that some degree of isoimmunization occurs more frequently than suspected. The small size of modern families has also been used to help explain why hæmolytic disease of the newborn occurs probably not more than once in every 250 pregnancies instead of the 1 in 10 which would follow if every Rh-negative woman responded to a single stimulus of Rh antigen.

In the light of the above figures the suggestion that couples who are contemplating matrimony should first of all have Rh tests done on their blood loses practical significance. Even though the tests show the prospective bride is Rh negative and the groom Rh positive, their intention to marry is unlikely to be influenced by the results of the tests when it is explained that at least 24 matings out of 25, with similar Rh findings, raise normal children. Although it would seem most unreasonable to expect Rh tests to influence the course of true love, in no way does this detract from the medical importance of the Rh factor. When substances, including whole blood, are utilized in treatment it becomes the responsibility of those who administer them to take every possible precaution to prevent effects which either immediately endanger the life of a patient or produce changes which later may preclude normal reproduction. These and the immediate appropriate treatment of infants born with hæmolytic disease are the practical aspects of isoimmunization by red-cell-antigens as they relate to the practice of medicine.

PRACTICAL CONSIDERATIONS

(*a*) *Blood transfusions.*—In view of isoimmunization to the antigens present in human red blood cells, certain modifications of blood transfusion procedures become necessary. To rely on blood grouping as the sole method to determine that blood is suitable for transfusion is no longer permissible. To use the same donor for a second transfusion at a later date without further tests, merely because the first transfusion was followed by no untoward reaction, is to expose a patient to the hazard of a hæmolytic reaction through isoimmunization. It is perhaps safe to give, without cross-matching tests, a *first* transfusion of blood of the same group to male patients and women past the menopause who have never been pregnant.

In all pregnancy cases, in patients who previously have been transfused, and especially in female patients with a history of having had children afflicted with hæmolytic disease, it is essential that the bloods of donor and patient be cross-matched. For these cases no reliance can be placed on the results obtained from tests conducted according to the time-honoured procedure of open glass slides at room temperature. Such tests will indicate incompatibility due to the A-B-O and the M and P agglutinogens, but not to Rh. The techniques utilized for cross-matching tests must include those designed to detect Rh agglutinins and "blocking antibodies".

Some days are required for the initial development of antibodies through isoimmunization. When, therefore, patients require multiple transfusions fresh samples of blood for cross-matching should be taken before subsequent transfusions. Provided it can be ascertained with certainty that the patient has never before been exposed to an Rh antigen, it would seem unnecessary to take such samples unless more than seven days have elapsed between the first transfusion and the next one contemplated. If this period of time is exceeded another specimen of the patient's blood must be submitted to the laboratory in order to detect isoantibodies which possibly have developed in response to a preceding transfusion. If the patient has had a previous transfusion or been pregnant it is advisable to submit fresh samples at more frequent intervals when multiple transfusions are being given. Once the body has learned how to make isoantibodies they may be elaborated quickly in response to another injection of the antigen.

The Rh factor should be considered in all patients who have had previous transfusions or who are pregnant. It goes without saying that an Rh-negative patient who has had a child with hæmolytic disease should be given only Rh-negative blood. This is true even if many years have elapsed since the birth of the af-

fected infant and although Rh isoantibodies can no longer be demonstrated. For all practical purposes, once isoimmunization has occurred it should be considered as persisting for the remainder of a person's lifetime. It must also be remembered that a small number of Rh-positive people may be immunized by an Rh antigen not present in their own red cells. Consequently the Rh factor cannot be excluded as a cause of a transfusion reaction merely through the determination that the patient is Rh positive.

Since all the evidence indicates that isoimmunization of an Rh-negative person is permanent, careful consideration has to be given to the effect of transfusions when given to young women, girls, and female infants without taking the Rh factors into account. Those who are Rh negative may indeed be isoimmunized so that it may not be possible for them later to have normal Rh-positive children. It, therefore, is recommended that no transfusions be given to young girls or female infants until tests for Rh are conducted. Only Rh-negative blood should be given to those found to be Rh negative and Rh-compatible blood to those who are Rh positive. In this way the incidence of hæmolytic disease of the newborn may be reduced. It has even been suggested that the intramuscular injection of Rh-positive blood may lead to isoimmunization.[40]

In emergency transfusions, particularly in obstetrical cases when the delay required to perform cross-matching tests is considered to endanger the life of the patient, the least risk will be run by using Rh-negative blood of group O ("Universal donor") containing a low titre of anti-A and anti-B agglutinins.[41]

(*b*) *Hæmolytic disease of the newborn.*—In general one, two, or more pregnancies with Rh-positive children are required to produce isoimmunization to an Rh factor. Once this state has been induced it persists and all subsequent Rh-positive offspring will be affected with hæmolytic disease. It is of considerable importance to parents who have had a child with the disease to know whether or not there is any chance of an Rh-negative woman having normal children. This question can only be answered fully by determining whether the Rh-positive father is homozygous or heterozygous. If the Rh-positive father is homozygous then both genes, either one of which he may transmit, are Rh positive and hence all his children will be Rh positive. If he is heterozygous one gene is Rh positive and the other Rh negative and half of his children will be Rh negative. A heterozygous father explains why one of binovular twins is born with hæmolytic disease and the other is unaffected. Since repeated stimulation is usually necessary to bring about isoimmunization to an Rh antigen, one would anticipate that hæmolytic disease in small families would be encountered much more frequently in those having every child Rh positive than in families of the same size but with some of the children Rh negative. Studies[15] bear this out and support the generalization that once a child with hæmolytic disease has been born the chances are poor that subsequent children will be unaffected.

The demonstration that an infant who develops jaundice shortly after birth is Rh positive, the mother Rh negative and the father Rh positive does not establish a diagnosis of hæmolytic disease. The results of the Rh tests may be pure coincidence and in no way related to the clinical condition of the infant. To establish a diagnosis of hæmolytic disease in such cases it is necessary to show that the mother's serum contains Rh isoantibodies incompatible with the infant's red cells. In other instances both the mother and child will be Rh positive, but hæmolytic disease can be proved to have occurred from isoimmunization to one of the Rh antigens through the demonstration of a maternal Rh antibody which reacts with the infant's cells. In still others the incompatibility may involve the A-B antigens. These facts are pointed out in order that caution may be exercised in the diagnosis of hæmolytic disease in cases not presenting the classical manifestations without full laboratory confirmation, and also to indicate the direction laboratory investigations should take when such a tentative diagnosis is made.

The severity of hæmolyic disease of the newborn varies from an affection mild enough to easily be confused with physiological icterus to one so severe as to cause stillbirth. The clinical picture presented by the infant depends upon the amount of maternal Rh isoantibodies that have passed through the placenta into its body. In general there is poor correlation between the amount of maternal isoantibodies that produce agglutination in tests conducted in small tubes at body temperature and the severity of the disease in the infant. This situation has been clarified by the discovery of the Rh "blocking antibodies" which inhibit agglutination. They, therefore, produce the somewhat paradoxical situation of a high strength of Rh isoantibodies present in the maternal circulation with little or no agglutination occurring when the mother's serum is tested by the usual tube technique against the fetal or other Rh-positive cells. But if proper tests are conducted for the "blocking antibodies" this difficulty is overcome and antibody strength is reflected by the severity of the disease in the infant.[42] When an Rh-negative mother and a homozygous Rh-positive father have an infant afflicted with hæmolytic disease, each succeeding pregnancy will be followed generally, but not always, by more severe manifestations of the disease in the fetus. There is no method known now to

mitigate the harmful effects of the maternal isoantibodies on the fetus *in utero*.

The obstetrician with a patient whose last child was suspected of having hæmolytic disease, or undoubtedly did have, is confronted with several problems in relation to the management of the present pregnancy. When tests have shown that the antigen involved is Rh but it is not possible to determine whether the husband is homozygous or heterozygous, the mother's serum should be studied for Rh isoantibodies every two weeks from about the thirty-second week onwards. If Rh isoantibodies appear or increase in strength an Rh-positive, affected fetus is indicated but no conclusions can be made on the findings of isoantibodies that remain at a stationary level. It is believed that any prolongation of the time of exposure of the fetus to maternal Rh isoantibodies leads to an increase in the severity of hæmolytic disease particularly in regard to brain damage (kernicterus). The experience of some authorities[42] has been that premature delivery results in a greater number of living children recovering from hæmolytic disease while that of others[43] has been that there is nothing to be gained by such a procedure. Cappell[44] observed that infants with icterus gravis are unduly prone to intranatal death from asphyxia and recommended that everything should be done to obviate this risk. Opposed to premature delivery by Cæsarean section are the increased mortality, the handicap prematurity imposes on an affected infant and the survival of infants who probably were exposed to incompatible maternal antibodies from early in pregnancy.

Until we have a better understanding of the underlying phenomena through extension of our knowledge of Rh antibodies, and a sufficient number of cases have been studied, it would seem advisable to emphasize that preparations be made to treat the affected infant with compatible blood immediately after birth rather than to advocate premature delivery as a general procedure. However, when the parents are particularly desirous for a child and the previous pregnancy resulted in one that died of hæmolytic disease, it should be explained that a prematurity of two to four weeks may be beneficial to the infant in preventing further damage but no definite assurance can be given that it will result in a normal child. Due to the increased hazard to the mother for a result that must remain in doubt the final decision has to rest with the parents.

The treatment of infants born with hæmolytic disease consists of combating the anæmia and the prevention of further intravascular hæmolysis. It should be remembered that the infant has been passively immunized and that its blood may contain enough maternal isoantibody to hæmolyze not only its own red cells but also any other incompatible red cells. In over 90% of cases Rh antibodies will be responsible and treatment in these cases consists of transfusion of Rh-negative blood shown to be compatible with the *mother's serum*. Mollison[45] demonstrated that in such cases Rh-positive blood was eliminated from the infant's circulation within a few days' time, whereas Rh-negative blood remained for as long as three months. It is recommended that the infant be bottle-fed to prevent the passive transfer of Rh antibodies possibly contained in the mother's breast milk.

In the larger centres either panels of donors or stores of Rh-negative blood are kept to meet emergency needs but this is not so in less densely inhabited districts. One of the benefits which will accrue from the institution of a blood transfusion service by the Canadian Red Cross Society will be the availability throughout Canada of grouped and Rh tested blood. Until this is attained the proper treatment of hæmolytic disease of the newborn will present difficuties to the attending physician. It may be worth pointing out again, however, that hæmolytic disease results from maternal isoantibodies which damage the fetal but do not affect the maternal red cells. It follows, therefore, that the mother's *whole* blood should not be used for transfusing the infant as this would result in the introduction into the infant's circulation of additional isoantibodies incompatible with its red cells. On the other hand, the mother's *red cells*, freed from the antibodies contained in her plasma, will always be compatible and survive in the circulation of the fetus. The A-B-O groups of mother and child do not need to be considered in this connection because the newborn infant is immunologically immature and does not form its own agglutinins until several days or weeks after birth.[46] In consequence of this the only antibodies present in the circulation of a newborn child are maternal in origin and therefore must be compatible with red cells derived from the same circulatory system.

In emergency and problem cases the safest procedure is to wash the mother's citrated blood two or three times in saline and use the washed red cells to transfuse the infant. This procedure must, of course, be utilized at or shortly after birth. To give a second transfusion of maternal blood two or three weeks after birth without blood grouping and cross-matching tests might lead to a fatal hæmolytic transfusion reaction due to anti-A or anti-B agglutinins. The author is fully aware of the difficulties in many localities of the centrifuging and aseptic handling of the mother's blood but sometimes it may be more practical than trying to find an Rh-compatible donor. The use of Rh-positive blood in the treatment of hæmolytic disease due to the Rh factor may be justified as an emergency measure to sustain the life of the infant until a more suitable donor is found but it also prolongs and aggravates the disease. It hardly needs to be remarked that the father's blood will be in-

compatible with the isoantibody in the infant's circulation.

(*c*) *Paternity cases.*—Human red-cell-antigens are inherited in accordance with definite laws. The principal law is that agglutinogens cannot appear in the blood of a child unless present in the blood of one or both parents. The individual differences of human blood thus may be used to prove that a certain man or woman is not the parent of a certain child. Blood tests exclude paternity but they cannot prove parentage as the possibility of coincidence always exists. If the tests show that a child has inherited a blood factor not present in the blood of its mother or the accused man, then it follows that that individual could not have been the father of the child. By means of tests for the A-B-O groups, M-N and Rh types a falsely accused man has approximately a 45% chance of proving his innocence.[1] There are no laws in Canada at the present time which give courts the power to order blood tests in cases where parentage is in dispute.

SUMMARY

The different red-cell-antigens which enable an increasing number of varieties of human blood to be distinguished are outlined.

The clinical significance of these antigenic differences is that a person lacking one of the red-cell-antigens may be isoimmunized if that particular antigen gains access to his circulation. This may occur from blood transfusions or from a fetus *in utero*.

Some people are readily isoimmunized while others are not; the reason for this difference is not clearly understood.

Hæmolytic transfusion reactions and hæmolytic disease of the fetus and newborn are caused by immune isoantibodies; in most instances Rh isoantibodies.

This new knowledge has established the need for complete tests prior to blood transfusion. It also has provided a basis for the appropriate treatment of infants afflicted with hæmolytic disease, but, so far, has not resulted in the development of any therapeutic procedure to mitigate the harmful effects on the fetus *in utero*.

Female patients prior to and during the childbearing age have been isoimmunized to Rh antigens by transfusions of blood. As isoimmunization appears to last for many years, failure to take the Rh factors into account in the transfusion of young female patients may later result in repeated failures to have normal offspring.

Popular articles have made the public unduly conscious of the Rhesus factor. The fears of prospective couples and expectant mothers will be allayed considerably when the comparative rarity of serious isoimmunization is explained.

The author would like to express his appreciation of the valuable suggestions and criticisms made by his colleagues and by Dr. W. S. Stanbury.

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In general, our ranks are made up too largely of men overbalanced at one end of the scale or the other. At one end are mostly the younger men stressing the science of medicine and bewildered by the details of the practical handling of the patient. At the other end are the busy older practitioners who in lieu of ready knowledge of the newer therapies and intricacies of diagnosis lean heavily on their knowledge of the patient as a person, giving comfort but missing the satisfactions that come with the thorough understanding of the disease process.—E. E. Kattwinkel, *The Diplomate*, April, 1946.

CLINICAL and LABORATORY NOTES

FURTHER EXPERIENCE WITH THE SLANTED CAPILLARY METHOD FOR Rh TYPING OF RED BLOOD CELLS

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Since first describing this method[1] we have found that it can be simplified without loss of accuracy.

Principle of the method.—It was our original observation that if 1 c.c. of a 2% suspension of red cells and 1 drop of active agglutinating serum were placed in a 7 mm. bore test-tube on a slight slant in the incubator for an hour, Rh-positive cells would adhere to the lower wall of the tube. The cells therefore became sticky enough to adhere to glass if the tube was not shaken. We then tried smaller tubes and eventually found that when capillary tubes of approximately 0.4 mm. bore containing a mixture of cells and agglutinating serum were set up at an angle of 45° from the horizontal, the Rh-positive cells formed into clumps easily seen by the unaided eye, whereas Rh-negative cells showed no such tendency. The blood can be seen to flow down the tube fairly rapidly at first, so that a solid butt of cells forms at its lower end, while at the same time some of the cells precipitate vertically on to the lower wall of the tube. Once here they move slowly. It is our conception that the gentle movement of the cells allows their slight stickiness to exert its full agglutinating force, and so show up clumping that would not otherwise be readily perceptible. That the cells are sticky is readily seen if larger slanted tubes are used.

Wiener[2] has offered a different suggestion, namely that the test is based on the "conglutinin phenomenon". But since he states that "even slight dilution of the serum or plasma with saline, eliminates or weakens the reaction" of the conglutinin phenomenon, and since in the capillary test one may wash the red cells several times and suspend them in saline and still get undiminished agglutination, it does not seem to us possible that the test is so based, providing Wiener is correct in his statement on the effect of saline. On the other hand one may get an appearance of agglutination no matter what the Rh characteristics of the cells and serum are if whole, undiluted serum is used or if the blood under test is suspended in its own, undiluted serum or plasma. This false positive reaction must be constantly borne in mind when searching for agglutinins. *The test cannot be done with undiluted serum or plasma whether one is doing Rh typing or searching for agglutinins.*

* Assisted by a grant from the National Research Council, Ottawa.

THE METHOD

1. *Apparatus.*—Fig. 1 illustrates the chief piece of apparatus we are now using in group studies. It is essentially a box in which 25-watt, cylindrical, Mazda, electric lights supply light and warmth to a piece of x-ray-viewing-box glass 7 to 7.5 cm. high inclined at 45° from the horizontal with the lower edge set in a strip of plasticine. The size of the box of course can be varied according to the number of tests a day to be run. For office practice one can use any small, covered, metal box, say about one inch square and half an inch high, to hold the plasticine, and can read the tests against a piece of white paper. The agglutination test is carried out in capillary tubes approximately 9.5 cm. long and with an inside diameter of 0.4 mm. These are sold commercially as coagulation tubes and are available through any supply house.* For ease in handling, the tube used is about 2 cm. longer than the height of the viewing box glass. Lastly we find an ophthalmologist's binocular loupe useful in reading the earliest reactions and the rare doubtful one.

2. *Sera.*—(*a*) For Rh typing of red cells we originally used human sera provided us for experimental purposes by Dr. Louis K. Diamond. Dr. Diamond has most generously continued to supply us with special sera,† but we prepare our own anti-Rh_0 (standard or 85% sera) from suitable donors. These sera are neutralized by the addition of Witebsky's[3] soluble A and B factors,‡ and suitably diluted.

3. *Blood.*—Blood diluted with equal parts of 3.8% citrate as described in the single-test technique is completely satisfactory. The cells may be washed in saline if desired. In a group survey of pregnant women we are using blood taken for routine Wassermanns. After the blood has clotted some of the serum and cells are pipetted into a test-tube, centrifuged, the serum pipetted off to be tested for antibodies, the cells washed once in saline and suspended in approximately twice their volume of saline. This makes a satisfactory cell suspension.

4. *The test.*—(*a*) Single tests. The procedure is illustrated in Fig. 1. Dip the tip of a capillary into the serum and allow a column of about 1.5 cm. to run in. Lay the capillary on a gentle slant on the table, the serum-filled end down. This is to prevent an air bubble being present between serum and cells. Prick the finger; express a drop of blood; place beside it an approximately equal drop of citrate; mix; allow a column of blood about equal to the column of serum to run in. (One really cannot speak of a "column of blood." The blood and serum partially mix as the blood runs in, so that in a 3 cm. column of fluid one has at one end almost pure blood, then a filament of blood running through serum, and then serum alone.) Invert the tube. The blood and serum run more or less rapidly toward the lower end. When the column is about centred, place the tip of the forefinger on the upper end of the tube to stop the flow. Stick the empty, lower end in the plasticine, with the tube on an angle of 45° from the horizontal. Read in 30 minutes or less.

(*b*) *Multiple tests.*—It is not necessary to make the box as described under "Equipment" in order to try out a series of reactions; one may, as a preliminary trial of the method, use some plasticine spread a quarter of an inch thick along a piece of board an inch or so

* We have found the "Coagulation Tubes" manufactured by Progressive Laboratory Specialties Co., 146-16 Hillside Avenue, Jamaica, N.Y. the most satisfactory for this purpose among the various ones we have tried.

† We are also indebted to Dr. Peter Vogel for an ampoule of powerful anti-Hr serum.

‡ Kindly provided by Eli Lilly and Company.

CAPILLARY METHODS OF RH TYPING

For Clotted, Citrated or Oxalated blood in a tube

1 Run ¼ to 1 cc of blood into a small tube and add about 5 cc of saline

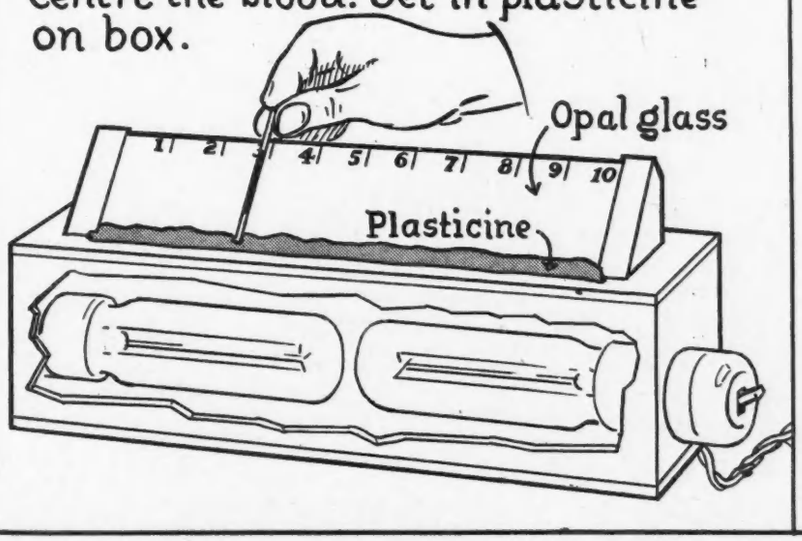
2 Centrifuge

3 Pour off saline. Shake up cells. This gives a 25% to 50% cell suspension

4 Dip tip of capillary in the anti-RH serum. Let ½ to 1 inch run in

5 Dip serum-filled end of capillary in the blood. Let ¼ to ½ inch run in

6 For both - INVERT the capillary. Centre the blood. Set in plasticine on box.



For drop of Citrated Blood from patient or donor

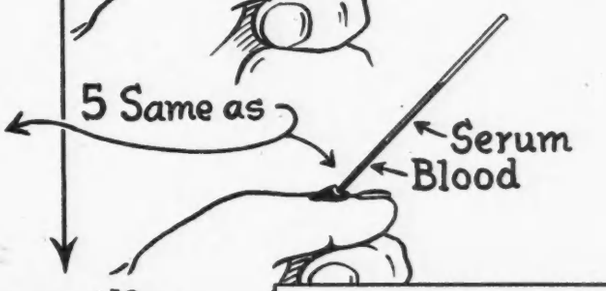
1 Dip tip of Capillary in the anti-RH serum. Let ½ to 1 inch run in. Lay on desk

2 Puncture skin. Express a small drop of blood

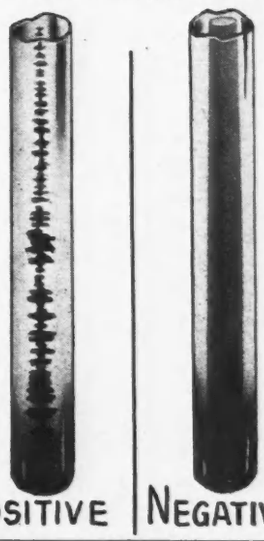
3 Place a drop of 3.8% citrate beside it

4

5 Same as



THE REACTIONS



wide and of any length. (Four capillaries to the linear inch make easy reading). Take serum into the required number of capillaries, and place them side by side on a gentle slope on the table. Take up the first tube, dip it into the washed saline-diluted blood; invert, and insert the empty end into the plasticine at an angle of 45° as above, and so proceed along the row. We set about twenty capillaries out at a time, since the serum will begin to dry away from the tip before the last one is used if more than twenty are used at a time. Further, the method is so rapid that by the time twenty tubes are set up clumping will have taken place in the first positive ones, so that these can be discarded and replaced by further bloods under test. If the viewing box is used the capillaries are automatically set at 45°, with the blood-serum column centred over the illuminated, warm glass.

The reaction.—The reaction is illustrated in Fig. 1. Rh-positive cells form into a series of beads or clumps; Rh-negative cells form a smooth ribbon. The reaction is rapid. At room temperature (70° F.) with a good serum, most positive reactions are easily visible in five minutes. Nearly all Rh-positive reactions will be full blown in 15 minutes, but a very occasional one will take 30 minutes. We make our Rh-positive readings as soon as they are visible, but do not record any negative until thirty minutes are up. With weak sera, the reaction will be slower.

The speed of reaction varies directly with the strength of the serum, so that, in titration of sera one can plot time of appearance of agglutination against dilution. The titre of a serum varies with the genotype of the cells used, whether one uses this or the test-tube method of titration. This latter fact was beautifully illustrated in the Drummond, Taylor and Edwards case.[4] Dr. Drummond has given me the following information in addition to that published:

Genotype of test cells	*Titre of serum against such cells*
Rh_1 Rh_1	1,024,000
Rh_1 Rh_2	655,000
Rh_2 rh	163,000

These factors affecting speed of agglutination should be born in mind in selecting a serum for testing by this method. We like to use one in which at least half the positives are clear cut in five minutes.

Accuracy of the test.—In a series of 200 tests carried out in parallel by this method and the standard method we had complete agreement. In 2,000 pregnant, white women we found 83.1% positive. In 600 unselected Japanese 98.8% were positive. In all cases of erythroblastosis that we have encountered except one, the mothers have been negative by this method of testing, and that woman's serum contained anti-Rh antibody. In our hands we feel that this method is as accurate as the test-tube method, and for the average technician we think it is more accurate.

ERRORS

Technical.—(1) It cannot be too strongly emphasized that too strong a concentration of blood serum can give a false positive. In the single test technique it is probably better to err on the side of having the drop of citrate larger, rather than smaller, than the drop of blood, though actually we have had no difficulty with the single tests. One is most likely to make mistakes under two circumstances:

(*a*) In testing a serum for the presence of antibodies using Group O Rh-positive cells as the test cells one may, since it is not necessary to remove anti-A and anti-B agglutinins, easily forget and set up the test with whole, undiluted serum. It is essential in this test to use washed cells and to dilute the serum, one part of serum and three parts of saline (or saline and Witebsky's fluid if the latter is used).

(*b*) Where blood for testing is sent in in a tube, either clotted or unclotted, we have repeatedly seen the cells incorrectly reported as Rh-positive because they had simply been shaken up in their serum or plasma and so used without washing.

(2) The use of weak serum. This has been a weakness in all methods and is just as much of a drawback in this method as in any other. (3) The use of old cells or contaminated cells. Blood is best tested fresh, but we have carried out tests on some blood samples over a three weeks' period, with constant results. (4) Having too little blood. To get clear-cut clumping one needs a good column of blood in the capillary. A suspension of about 25% is best, although one can do the test on an exceedingly minute quantity of blood.

Biological.—In July of last year we ran across three cases of erythroblastosis, and in August a fourth case, in which the mothers were Rh-negative and the babies temporarily so. One of these families we had studied carefully. The father was Rh_1 Rh_2, the mother rh rh. There had previously been, first, three normal children, then five with icterus gravis, then a macerated fetus. The living children were Rh_1 rh and Rh_2 rh. The tenth child at birth had a large liver and spleen and became jaundiced within six hours, yet its cells, tested with three anti-Rh_0 sera, and by both the capillary and the standard method, were negative. (It tested Rh′ rh.) Our guess was that all the baby's cells were blocked by a blocking antibody, preventing their agglutination by anti-Rh_0 serum. Its cord blood contained an antibody demonstrable by Diamond and Abelson's slide technique.[5, 6] This baby survived and at six weeks its cells are weakly agglutinated by an anti-Rh_0 serum that earlier failed to agglutinate them. In a second case the cells became weakly agglutinable at five weeks. In the other two the negative phase was shorter.

Wiener[2] has reported seeing three such cases, which probably occurred in June and July, a curious and possibly significant seasonal grouping. This apparently rare source of error has to be kept in mind whether capillary or test-tube method is used. As Wiener points out, and we have confirmed, the sera of such babies contain antibodies demonstrable by Diamond and Abelson's technique.

USE OF THE CAPILLARY METHOD FOR THE DETECTION AND TITRATION OF AGGLUTININS

(*a*) *Detection.*—As stated above, if one mixes any full strength serum with A-B-O compatible cells in a slanted capillary, clumping may take place. Even when an individual's own cells are

added to his own serum this may happen. Sometimes the clumping diminishes on standing for some time, but usually it is not clearly distinguishable from true Rh clumping. We have not studied the cause of this phenomenon. It is simply overcome by diluting the serum with three volumes of normal saline. Only agglutinins of greater strength than 1:4 can be detected with certainty by this method.

(*b*) *Titration of agglutinins.*—The method is satisfactory for the titration of stronger sera. In parallel titrations carried out in Philip Levine's laboratory, he using the test tube method and one of us the capillary, we found our determinations of titre generally the same when judged by the naked eye. Under the microscope Levine could carry his end-point one or two dilutions further.

DISCUSSION

For Rh typing this test, it seems to us, is of particular use in three ways. It can be used at the bed-side or in the office and an answer had in a few minutes. It lends itself to mass surveys because of the minute amounts of serum used. Surveys can be carried out in places remote from the usual laboratory equipment. Apart from these particular uses we think it as accurate as the test-tube method, and in the hands of a general purpose technician we think it more accurate. Further it has the advantage of speed, giving a clear-cut reaction in five to ten minutes with most Rh-positive bloods.

SUMMARY

A simplified form of the slanted capillary tube technique for Rh typing is described. It is rapid, accurate, economical of serum and can be done with a minimum of apparatus. Our experience with it, extending to nearly 15,000 tests, has proved very satisfactory. For the first detection of antibodies it is not valuable, but is an accurate method for the titration of agglutinins in titres greater than 1:4.

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INDWELLING CATHETER VS. INTERMITTENT CATHETERIZATION

By E. S. Hicks, M.D.

Brantford Clinic, Brantford, Ont.

Disturbed by the high incidence of cystitis, ascending infection and noteworthy bladder distress following postoperative intermittent catheterization, we as a group began a study of these complications. We found that 20% of all major surgical patients required catheterization, and 18% of these had trouble. Our ideas on the indwelling catheter are based on records of two thousand cases, largely female. We are reporting this study because our morbidity rate with the indwelling catheter was only 3%.

Objections to intermittent catheterization.—The patient subjected to intermittent catheterization rarely gets a square deal. Inexperienced help, the cutting short of preparations, the impossibility of rendering the vulva aseptic in the ward, poor vision, use of too large catheters and unsterile lubricants, with the apprehension of the patient and consequent spasm and trauma are all factors day by day in every hospital.

Effects of residual urine.—All authors are agreed that poor drainage at any part of the urinary tract predisposes to infection; that overdistension of the bladder and residual urine are the prime factors leading to infection; that a normal bladder can be catheterized once with impunity but repeated catheterization carries a real menace. Keyes states that catheterization gently performed with a dirty catheter is better tolerated than an aseptic catheterization roughly performed.

Type of catheter.—We prefer a 12 to 16 French winged catheter. We can use a small, soft, Pezzer catheter. Whatever the type it must be soft enough to collapse easily. If this is the case there is no pain on the removal which is accomplished by simple traction. We have no objection to the Foley catheter, but have not used it on account of the expense involved.

METHOD OF USE

The usual preoperative catheterization in the ward is omitted.

At the conclusion of the vaginal part of the operation, with all the sterile draping still in place, the catheter chosen is picked up about four inches from the end and a probe is placed against the hard point in the end of the catheter. It is easier to use the sharp point in the flat end of the probe. When it catches, the catheter is pulled down on it so that the wings straighten out. The catheter and probe are held together in the right hand poised like a pen. With the left hand the vulva is separated and the catheter inserted under perfect vision. No trauma is necessary. It is hard to traumatize a relaxed urethra. The bladder is allowed to drain. The catheter is pulled down till slight resistance is felt. It is re-inserted half an inch. The catheter

is then fastened without tension with two adhesive strips of dumb-bell type, one near the labia and one on the upper part of the thigh. This is to avoid dislodging the catheter, as, if it slides under the leg it could be pulled out when moving the patient. The catheter is not clamped. A small gauze pad is placed over the end.

The catheter is placed in a sterile urinal when the patient returns to bed.

Time for removal.—When the patient can pass flatus voluntarily a small enema is given and the catheter removed after the subsequent bowel movement. We remove the catheter if the patient is urinating around it. Ordinarily the catheter is out by the morning of the third postoperative day.

We all know from practical experience in vaginal hysterectomies, vesico-vaginal fistula, etc., that these small catheters can be left in much longer with impunity.

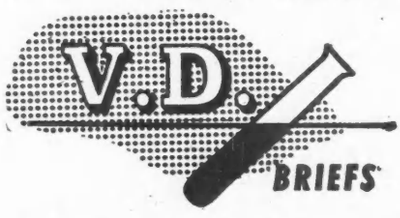
Safeguards.—(1) By this method only one catheterization occurs. (2) The catheterization is properly done. (3) The bladder is empty and stays empty for the abdominal part of the operation. (4) An empty bladder tends to avoid injury to the bladder in anyone's hands, tyro or master surgeon. (5) As all tension is removed the bladder can heal quickly if accidentally injured. (6) It avoids abdominal distension. We especially find it useful in operations for hernia. (7) It is a safeguard against the surgeon who writes an order for an intravenous and at the same time writes an order for eight to twelve hour catheterization.

Chemotherapy.—No sulfa drugs or penicillin have been used in any of the patients included in this series. They may be a help in patients known to have urinary infection preoperatively. Drugs are not the answer to this trouble and no antiseptic will render residual urine aseptic.

SUMMARY

The harmful effects of the indwelling catheter is one of the legends that has been handed down in surgical practice. We have given data to prove that it is a sensible and practical procedure, reducing the morbidity from 18 to 3%.

VENEREAL DISEASE CAMPAIGN



Prince Edward Island and Manitoba have joined with Alberta, Saskatchewan and British Columbia in enacting premarital health examination legislation which provides for a blood test for syphilis. The Alberta and Saskatchewan Acts were proclaimed last year, while the British Columbia law, enacted in 1938, is still awaiting proclamation.

The Prince Edward Island legislation—a separate Act in itself—comes into effect July 1, while the Manitoba Act, in the form of an amendment to the Marriage Act, will be proclaimed at a date to be decided later.

The Act approved by the Prince Edward Island legislature provides that all persons intending marriage shall, within a specified period, submit to such a premarital examination and shall supply the name of the other marriage partner.

If either partner is found to be affected by syphilis in a probably communicable stage or condition the other is to be notified. Further, no issuer shall issue a marriage licence nor shall any clergyman publish the banns of a marriage unless both parties produce proof that they have complied with provisions of the law in this respect.

As for non-residents intending marriage within the Province, the Chief Health Officer may accept a certification signed by a physician qualified to practise in any Province or area outside Prince Edward Island, provided that he is satisfied of the sufficiency of the blood test and clinical examination supporting such certification.

The amendment to the Manitoba Marriage Act provides for a blood test in each premarital medical examination, with reports on the test to be supplied the person concerned, through his or her physician, and to the Provincial Director of Preventive Medical Services. No person shall solemnize a marriage unless each of the parties concerned has delivered to him the required health certificate, which certificate, with the marriage licence attached, must be forwarded to the Provincial Health Department.

Linked with the Prince Edward Island legislation is the "Venereal Disease Prevention Act"—recently proclaimed—which provides for compulsory submission to treatment for persons with venereal disease. Also, the Chief Health Officer of the Province may enter any premises for the purpose of making inquiry and examination with respect to the state of health of any person on the premises. Appropriate action may be taken if any person on the premises is found to be suffering from a venereal disease.

"Find V.D. Contacts — Report V.D. Cases"

THE CANADIAN MEDICAL ASSOCIATION

Editorial Offices—3640 University Street, Montreal

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IS THERE DANGER OF AN OUTBREAK OF SMALLPOX IN CANADA?

THE answer, under present conditions, and based on the experience of other countries, must be yes. A devastating epidemic is unlikely, but there is definite risk of scattered localized outbreaks. Smallpox is more or less endemic in many parts of the world, especially the East and Middle East. Heavy post-war travel is facilitating its spread into areas usually relatively free. Returning service personnel have recently brought the disease to Britain and to the Pacific Coast of the United States. Several small epidemics with a few fatalities have already resulted, and recurrent introduction is probable for some time to come.

Canada is exposed to attack from three directions. Her own homecoming men may bring the infection directly across the Pacific, or it may enter through secondary contacts from below the border or from Europe. Because of the wide diffusion of the potential carriers after arrival, no community, however small or isolated, can be safe from the danger of invasion. Our country in recent times has known little of smallpox. Only five cases were reported last year and none in 1944. Few physicians, except some in the Services, have had personal experience with the disease. Unless the possibility of its occurrence is kept in mind, a mild or atypical case can easily be overlooked or passed off as rather odd chickenpox.

People in the Forces have as a rule been intensively vaccinated, especially if stationed in an area where smallpox is prevalent. Despite this, all are not immune. A writer in *The Lancet*, [March 9, 1946] discussing the question of imported smallpox, points out that "A well-vaccinated person . . . may develop a relatively mild attack of the disease with the eruption in so sparse and modified a form that the correct diagnosis is excusably missed." These cases, and contacts moving about during their incubation periods, are active factors in spreading the infection, the more dangerous because unsuspected.

Quarantine inspection at ports of entry has proved fairly effective in the past against ship-borne infection because the average voyage was often longer than the incubation period. If a case develops on board, it is isolated on arrival, and the contacts among crew and passengers vaccinated. The increased speed of modern sea transit has lessened the protective value of this routine inspection. It is of little practical use in connection with long distance air traffic, in which trips are timed in hours instead of days or weeks, and is obviously inapplicable to overland travel by train, automobile and plane from the United States. An occasional case of communicable disease, including smallpox, can easily slip through.

Under present conditions of extra hazard certain precautionary measures are therefore advisable. Vaccination admittedly does not in all cases give complete immunity against massive doses of virulent infection, but it usually protects effectively against ordinary exposure and minimizes the risk of a severe attack. The procedure should therefore be carried out in all healthy individuals, preferably at the age of six months, and repeated at intervals of about seven years. As it cannot be claimed that our own people are at present adequately protected, a campaign in support of vaccination and re-vaccination should be immediately begun. Newcomers from overseas and from infected areas in the United States should be required to give proof of recent vaccination, or submit to the operation on arrival. Exemptions granted to the aged and the ill, and perhaps to those who conscientiously object, will help to forestall any serious opposition.

If the great majority of the population are thus given a measure of protection, a careful watch kept for suspicious cases and isolation promptly enforced, contacts sought for and intensively re-vaccinated, and the public health authorities firmly supported, outbreaks of smallpox may not be entirely prevented, but they can soon be brought under control. R.C.S.

EDITORIAL COMMENTS

Meningococcal Meningitis

Of interest is a recent report[1] of the endemic and epidemic aspects of meningococcal meningitis, which, presumably due to war conditions, has recently presented itself in epidemic proportions. Statistics for the United States indicate 1943 as the peak year, with the number of cases reported in 1943 and 1944 being the largest ever recorded. This experience has been worldwide. With the outbreak of hostilities in 1939 almost all the countries of the world have reported a greater incidence than in any previous epidemic.

Throughout the world there occurred a decline in the incidence of cerebrospinal meningitis following the epidemic at the close of World War I. The disease again gained epidemic proportions in 1929, first in North America and Eastern Europe, and a year or two later in Western Europe. There is no satisfactory explanation as to why the United States epidemic in 1936 had no counterpart in Europe, and why Australia and New Zealand have been relatively free of the infection between the two wars.

It is gratifying to note that the case fatality has been effectively reduced. For the United States as a whole "the case fatality of cerebrospinal meningitis, based on reported cases, has declined from 55% in 1930 to 39% in 1940 and 16% in 1943". In the first World War the United States Army had a 39% mortality. The effectiveness of the sulfonamides is shown by the fact that among cases occurring in the Fourth Service Command in the first 6 months of 1943, the mortality was reported to be only 3.3%.

MEDICAL ECONOMICS

The Wagner-Murray-Dingell Bill

[*The following extract has been taken from the condensed verbatim report in the "Journal of the American Medical Association" of the U.S. Senate Committee hearings on the Wagner-Murray-Dingell Bill. These hearings have been appearing regularly in the J. Am. M. Ass. and are worthy of the closest attention. We have been permitted to make the present extract from the J. Am. M. Ass., May 18, 1946. In it the case against compulsory health insurance is stated in admirably clear form. We have not the space for full reproduction of the very interesting cross examination of the witness, Dr. Goin, and have selected only some of the points brought out.—Ed. Canad. M. A. J.*]

STATEMENT OF DR. LOWELL S. GOIN OF LOS ANGELES

Dr. Goin: I am Lowell S. Goin of Los Angeles. I am a practicing physician, and I happen to be president of the California Physicians Service, which is a voluntary health care plan of California, and I am also president of the College of Radiology and the Radiological Society of North America. I feel a great sympathy for the objectives which are hoped to be attained by the enactment of this bill, and I admire the humanitarianism of those who work so hard for their attainment. There is not the slightest doubt that the sudden and unpredictable imposition of heavy costs for medical care is frequently catastrophic. The physicians of America are well aware of this and, individually and collectively, have devoted much time and energy to an attempt to solve the problem. They believe that a solution is becoming apparent and that, given reasonable time, will be reached. They believe that the solution will be a better one than that currently proposed and that more medical care, and much better medical care, will be available to the American people if voluntary plans are allowed to evolve than if compulsory health insurance becomes law. If it be argued that no voluntary plan completely meets the need, I reply that that is true, but that evolution is not a rapid process and that, in a field in which there is little or no experience, haste must be made slowly. That this is likewise true in government controlled compulsory health insurance plans is shown by German and British experience. Title II of S. 1606 (for example) contains seventeen sections, but the German insurance law had (before the war) grown to more than 3,300 sections—a certain indication of the complexity of the problem and of the impossibility of composing a neat and effective solution.

The American Medical Association, speaking (I am confident) for the overwhelming majority of American physicians, opposes this legislation on five grounds:

1. The existence of a need for it has been established more by emotional statements than by logic and documented facts.

2. Even if the need were soundly established there is no experience to indicate that compulsory health insurance would benefit the public health, although there is some reason to believe that it would lower the health standards.

3. The costs are totally unpredictable, and no one has even a fair idea of what such a program would cost.

4. Medical care is not the sole factor involved in good health, and there are many things that could properly be done to benefit the public health before we embark on a program such as is proposed.

5. Voluntary health plans are more in keeping with the American tradition and will result in far better care being given to our people.

I should like now to discuss each of these five points in turn:

1. The social planner maintains that the state of health of the American public is deplorable and that medical neglect is a commonplace oc-

1. GOVER, M. AND JACKSON, G: Public Health Reports, U.S. Public Health Service, **61**: 433, 1946.

currence. The reason, they say, is the interposition of a financial barrier between the sick man and the doctor and argue that to remove this barrier will solve our health problem. Last fall the President of the United States in a message to Congress pointed with horror to the shocking figures of Selective Service rejections as an indication of the dire need for the enactment of compulsory health insurance. Is it of no significance that our mortality and morbidity rates are among the lowest in the world? Is it an accident that the United States now leads the world in medical education? Is our constantly increasing expectancy of life a reflection of our deplorable state of health? Do you know that the American death rate for diphtheria is about one-half that of Great Britain or prewar Germany? Diphtheria, incidentally, is an excellent indicator, since it is one of the few diseases for which we have specific preventive and curative measures, and since, there being no secrets involved, the German and British physicians know as well how to treat it as do Americans.

So much has been made of the Selective Service rejection figures, the 5,000,000 4-F's, that they deserve a moment of special attention. Senator Pepper's interim report analyzes the 4,217,000 rejectees and breaks them down into groups. 444,800 were rejected as "manifestly disqualified". These included the armless and the legless, the totally blind, the totally deaf, the deaf mutes, and so on. What medical care could have made this group whole? How shall the amputated leg be restored, and who knows how to cure optic disease? The modern concept is that mental disease is largely a constitutional inborn inability to cope with reality. What has medical care to do with it? 582,100 were rejected for mental deficiency. That is to say, they simply lacked the intelligence to become soldiers or sailors or, indeed, useful citizens of any sort. They are the idiots, the imbeciles and the low grade morons. Even a very slight knowledge of eugenics will persuade any one that this group does not constitute a medical care problem. Together, these three groups reach a total of 1,727,600, or more than one-third of the rejectees. If they are now excluded, there remain 2,426,500, a little less than one-half the famous 5,000,000; 320,000 of these were rejected for musculoskeletal defects.

Senator Donnell: Of the total number, you mean?

Dr. Goin: That is the congenitally short leg, the club foot, the withered arm, the congenitally dislocated hip, the absence of a half vertebra and the consequent crooked back. How, I ask, would medical care have restored these unfortunates to usefulness? 280,000 were rejected for syphilis. Treatment for syphilis is offered freely everywhere. As a matter of fact our statute books are simply loaded about syphilis prevention. I doubt that there is a community in which a syphilitic person may not receive treatment from a department of public health. One wonders how compulsory health insurance would have eliminated this group; 220,000 were rejected for hernia, probably for hernias so severe that the Army was unwilling to attempt repair. I mean by that that likely these were bad hernias because I did think the army repaired some. Hernia is the result of a congenital defect in the inguinal or femoral canal, presumably due to a defect in the germ plasm. If such a defect exists, its bearer is likely to have a hernia, and medical care has nothing whatever to do with the occurrence of hernia; 160,000 were rejected for "eyes", by which I suppose is meant defective vision. Now it is true that some forms of blindness (ophthalmia neonatorum, for example) may be prevented by adequate medical care, and I think every state has a law requiring the instillation of silver into the eyes of the newborn, and it is my belief that ophthalmia neonatorum is practically an extinct disease, but I think it fair to assume that this group of 160,000 did not include the blind but those with visual errors too great to permit good or even fair vision. If one is born with an eyeball too long or too short or one that is not symmetrical, then one will have a refractive error and one will either wear glasses or not see very well, and medical care again has nothing at all to do with it. These groups total about 1,000,000, and the rejections which might be due to a lack of medical care are thus reduced to about 1,500,000, or about one-third of the shocking figure of 5,000,000. Although it is quite problematic whether any program of medical care would have altered substantially this figure, we many rest on it, confident that the figures fall a good bit short of establishing an urgent need for the enactment of compulsory health insurance.

2. Even if we had had thoroughly established the need for some better plan for medical care, it would be proper to inquire whether a proposed plan offered some reasonable probability of improving public health. Since compulsory health insurance has existed in various parts of the world for fairly long periods, it should be possible to examine the experience in those areas and, by analogy, establish the probable effect of our plans on our own health. I think it quite interesting to note that compulsory health insurance has been in effect in San Francisco for some years as regards the municipal employees. The insured are served by the same physicians and in the same hospitals as are noninsured persons. In spite of the fact that no financial barrier exists between an insured person and a physician, the incidence of ruptured appendix is higher among the insured than among the uninsured. In this instance, at least, the removal of the financial barrier, so abhorred of the social planner, did not seem

to benefit the insured public. The morbidity and mortality rates are higher in nearly all insurance countries than in our own. May I quote to you from Dr. Nathan Sinai's book "The War of Health Insurance"? Remember that he is a most able and ardent advocate of compulsory Health Insurance. He says that, "Contrary to all predictions, the most startling thing about the vital statistics of insurance countries is the steady and fairly rapid rate of increase in the number of days the average person is sick annually and the continuously increasing duration of such sickness. Various studies in the United States (he says) seem to show that the average recorded sickness per individual is from seven to nine days per year. It is nearly twice that amount among the insured population of Great Britain and Germany and has practically doubled in both countries since the installation of insurance."

Senator Donnell: Might I ask a question? What is the approximate date of Dr. Sinai's book, if you know?

Dr. Goin: I would say roughly 1943 or 1944, maybe it is 1942. This seems to me a rather sound argument against compulsory health insurance. although Dr. Sinai probably did not intend it thus. To clinch the matter, he adds "It seems to be a safe conclusion that insurance has certainly not reduced the amount of sickness". This puzzles me a little, since I have naïvely assumed that the intent was to reduce the amount of sickness and to improve health. I believe that the evidence in hand warrants the flat statement that compulsory health insurance will not benefit the public health.

3. When compulsory health insurance was proposed in California a year ago last January, no one appeared with any sound idea as to its cost. The guesses varied between $20 per person per year and $80 per person per year. Most thought that $40 was a fair figure. I think it significant that costs are nowhere discussed in the present bill, the Surgeon General of the Public Health Service being given a blank cheque. At $40 per person per year the program would cost 4,000 million dollars, and no one really knows whether this amount would suffice. Experience elsewhere indicates that there is needed at least one employee (not including those actually delivering medical service) for each hundred insured persons (Crownhard, J. G.: Sickness Insurance in Europe, 1938, p. 25). On this basis we would need to increase the government payroll by about 1.5 million employees. And yet, to pay this vast army, to pay the doctors, to pay for hospitalization and for the other benefits offered, no sums are named, no appropriations are made and no limits are set. This is a rich country, but no wealth is unlimited.

4. A sort of current custom is to use the terms "medical care" and "health" as if they were interchangeable—as though one were a synonym of the other. As a matter of fact, medical care is only a small part of the health problem —not even the most important part. Health consists largely in not being sick; medical care consists largely in an attempt to cure or alleviate disease. Nearly all—perhaps all—of the health legislation which has been proposed from time to time has been written by social planners, seldom, if ever, in consultation with physicians. Consequently nearly all of it contains much wishful thinking and not too much reality. Too much confidence is placed in preventive medicine, too much earnest belief that periodic health examinations will prevent disease, and all the legislation evidences a complete failure to understand that preventive medicine simply has not yet attained the goals wished for. To cite a few of the problems: How shall heart disease (except that due to rheumatic fever) be prevented? What sort of health examination will be efficient in its control? How shall we prevent, or even recognize, early brain tumours? Shall every one with a headache have encephalographic or ventriculographic studies? Shall we do gastrointestinal x-ray studies on every one with indigestion and, if so, where shall we obtain the skilled personnel? How are bone tumours prevented, and what periodic examination makes one aware of the pneumonia of next week? Medical care is, and will for a long time continue to be, the care of the sick, and this I repeat is only a fraction of the health problem. Some other fractions to which the government might well turn its attention are sanitation, hygiene, health education, adequate diet, good housing, adequate clothing, working conditions and "patent medicine" control. And there are many others. If government is sincerely interested in the health of the citizen, why should it not suppress "patent medicine" advertising? Why should it not regulate the cults and require that all who wish to practice the healing arts pass the same tests? Why should it not control radio publicity of nostrums, vitamins and the like? This current legislation is attacking only a small segment of the health problem, and even if it were to accomplish all that its proponents claim it still would not solve our health problems.

5. Voluntary health plans will, if given the opportunity, do the job, and do it better than government controlled plans can do. These plans, which already include a very large number of persons, are in accord with our traditional emphasis on personal responsibility, prudence, foresight and thrift. They have an American dignity which is lacking in the regimentation of compulsory health insurance. They can be and are more economically administered, they can and do give better medical care, and they will be and are supported by thousands of physicians who are bitterly and unalterably opposed to government controlled medicine. In California

we have made a good start. Our California Physicians Service offers medical care at modest costs. A quarter of a million of our people have availed themselves of it, and appear to be quite satisfied with it. The Farm Security Administration had a medical care program for the rural indigent. California Physicians Service took it over and gave better medical care for less money and to the satisfaction of those giving and receiving the care. California Physicians Service has just signed a contract with the State Grange providing medical care for nearly 100,000 farm people. These activities, which are duplicated in most of our states, are indications of how voluntary plans can meet the challenge—how they are meeting it, and how they will continue to do so with a steady and healthy growth if they are not crushed by the monster of bureaucratic control.

Senator Murray: Doctor, is it not true that most of the objections that are made to the compulsory system with reference to the relationship between physician and patient apply equally to the voluntary systems? Dr. Goin: Senator, I am really familiar only with the California voluntary system and in that instance I will answer "No, it is not true".

Senator Murray: Will you explain the California system again briefly? Dr. Goin: That is a voluntary health care plan in which people are enrolled as beneficiary members and are served by doctors who are professional members. The doctors are paid on what is called a unit basis; that is to say that the funds received in a given month are pooled and, after the necessary administrative expense and a reserve for unforeseen contingencies, such as an unexpected epidemic next month, are set aside, the remaining money is divided equally among the doctors on the basis of what service they have rendered. The minimum amount of medical service is presumed to be a visit to the doctor in his office, one office call. That is known as one unit. The fee schedule is then in multiples of that unit. There is no one that intervenes at all between the doctor and his patient. There are practically no regulations, none that I know of that concern the practice of medicine.

Senator Murray: Does your system give full coverage to the people that belong to it? Dr. Goin: Not quite, Senator.

Senator Murray: What do they cover? Dr. Goin: We have three types of contract that we offer. We offer the so-called catastrophic coverage, in which the insured is covered for hospitalization and surgery, including fractures and dislocations.

Senator Murray: That is only in cases of a catastrophe? Dr. Goin: It is a case requiring any sort of surgery plus fractures and dislocations which are considered to be surgery; they are specifically included. Then we have the same contract with the so-called medical rider, in which the patient receives medical care if he is hospitalized, and then we offer a third contract known as the "two visit deductible" in which the patient, the subscriber, is fully covered except that he must pay for the first two visits to the doctor. However, if the first two visits lead to hospitalization and surgery he is not obliged to pay for them. The purpose of the two visit deductible is to prevent the insured from imposing on the professional member.

Senator Murray: All three of the systems would not cover all the service that is proposed under the pending bill. Dr. Goin: All except the first two visits to the doctor, Senator.

Senator Murray: You do not provide for maternity care, do you? Dr. Goin: Yes, sir; after ten months. The subscriber must be a subscriber for ten months before she is eligible, but thereafter she is completely eligible.

Senator Murray: Do you provide dental care? Dr. Goin: No, sir.

Senator Murray: And no nursing care? Dr. Goin: The ordinary floor nursing in the hospital, no home nursing.

Senator Murray: And no eye care? Dr. Goin: What do you mean by that?

Senator Murray: Medical treatment of the eyes. Dr. Goin: We do not prescribe glasses, but any eye disease is just as amenable to treatment as any other disease.

Senator Murray: You take the position that the compulsory system would result in a deterioration of the medical service, of the medical profession in the country? Dr. Goin: I am persuaded of it.

Senator Murray: Is it not true that at one time the American medical profession considered favourably compulsory— Dr. Goin: That is true. I think we are all entitled to one mistake.

Senator Murray: That was a serious mistake made by very excellent men. Dr. Goin: That is right; but since that time we have developed a good deal of experience.

Senator Murray: But for a long time you were also opposed to a voluntary system. Dr. Goin: I could not say that is true. I think the American Medical Association did not regard voluntary care plans with much favour for some time, largely because there had been no experience developed, and no one knew how to do these things or whether they could be done. I think the doctors are rather complete realists. We face conditions as they are. If we have an incurable patient, for example, we do not hope to cure the patient, we hope to make him as comfortable as possible until death intervenes. They thus learn to be realistic. To want to do something and to do it are not synonymous terms, and I think for a long time we doubted whether there was enough experience in the world to justify any type of health insurance. I think slowly it is developing that there is an increasing amount of experience which does justify it, and therefore we have reversed our attitude and we now support these matters.

Senator Murray: Without some system of insurance, or some means of making modern medical care available to a large section of the people of this country, they would go without adequate care. Dr. Goin: No, I could not agree to that, Sir.

Senator Murray: You do not accept that at all? Dr. Goin: No, I do not.

Senator Murray: You think that the American people can get all the medical care they need? Dr. Goin: I heard Senator Pepper this morning describe the lack of medical care in his home state. Of course, I have no way to know what occurs in Senator Pepper's home state. But I can say this, that I have been in the practice of medicine for thirty-four years and that during that time I have never refused any person any medical care that I thought I was competent to give, nor do I know any of my fellows that have done so. Now perhaps there are people who have done otherwise.

Senator Murray: You think that the present system, then, of having the medical profession wherever they find patients coming to them that are unable to pay, that they should accept those patients and care for them? Dr. Goin: I certainly do. I think it is not only their duty, I think it is their privilege to do so.

Senator Murray: And you think that that would be the result in this country, if we did not have any compulsory system? Dr. Goin: No, sir. I do not wish to be misunderstood. I do not argue for the maintenance of the *status quo*. I think we must find some better way to distribute medical care. I am not yet sure what that better way is. My preference for the moment is for voluntary health care plans, but I think it is also true that one need not be sure of the right answer to know when the wrong answer is wrong.

Senator Murray: Of course, there are a great many members of the profession, and even members of the American Medical Association who disagree with you in these views. Dr. Goin: Well, a great many in that a few thousand are a great many. But I think 95% of the physicians of America would agree with my views.

[*Senator Murray then read a statement showing that a group of well known physicians, all members of the American Medical Association, in a telegram to Dr. Channing Frothingham, took sharp exception to the American Medical Association's stand on the Wagner-Murray-Dingell Bill.—Ed. Canad. M. A. J.*]

Senator Murray: So there are a great many doctors around the country that are giving study to this problem and are of the opinion that a compulsory health system would be advisable in this country. Dr. Goin: Senator, might I remark that it is not at all established that these men have given study to this problem? Perhaps they are well wishers who would like to see good done to humanity. It, I think, would be very interesting to know how many of the telegrams Dr. Frothingham sent out did not get affirmative answers. I spent Sunday with a man in New York who is a professor of pædiatrics at Columbia who refused to send such a telegram. His name is not there. I do not think it is a very large number compared to the number of doctors, and if it please the committee I could within ten days get a similar telegram signed by one thousand names for each name on there.

Senator Murray: I am not disputing that. I am merely pointing out that these men who are on that list are men of prominent standing and distinction in the country. Dr. Goin: That is true.

Senator Murray: And that they are giving study to the problem and are of the opinion that a compulsory health system is advisable. Dr. Goin: That is right. Some of them have devoted their lives to getting a compulsory health system activity. Peters, Addis and Butler, for instance, devoted almost their entire lives to getting such a system. I presume they are sincere.

Senator Murray: When did these doctors commence to promote such a program? Dr. Goin: I know Addis, to my personal knowledge, has been advocating it for sixteen years.

Senator Murray: And the American Medical Association generally opposes it? Dr. Goin: That is right.

Senator Murray: I notice that in this report of "Medical Care for the American People", which was issued in 1932, a committee on the costs of medical care, that the American Medical group at that time was opposed to the voluntary system. That is true, is it not? Dr. Goin: I could not say, but I would not be at all surprised, because as I said before at that time we had no body of facts on which to proceed on a voluntary health care plan, and they had to be worked out piecemeal, slowly, painfully and frequently expensively.

Senator Murray: I had reference here to the minority report at that time signed by— Dr. Goin: The signers of the minority report do not represent the American Medical Association. It represents eight doctors, members of this committee.

Senator Murray: The members who were on that committee at that time? Dr. Goin: Well, they were just doctors who were on the committee. I do not know if they are even members of the American Medical Association. They were certainly not there in that capacity.

Senator Murray: They consist of A. C. Christie, George E. Follansbee, M. L. Harris, Kirby S. Cowlett, Arthur C. Morton, N. B. Van Etten, Robert Wilson, Alphonse M. Schwitalla and Olin West. Dr. Goin: Schwitalla, for instance, is a Jesuit priest; not a doctor at all.

Senator Murray: He is a professor at St. Louis University. Dr. Goin: He is dean of the St. Louis Medical University and is a priest; not a physician.

Senator Murray: I understand that. He is a student of these problems. Dr. Goin: But not a member of the American Medical Association.

Senator Donnell: If I may interrupt, I call attention to page 151 of the volume from which the chairman is reading at which Dr. Schwitalla is described as "A. M. Schwitalla, Ph.D." I think the other gentlemen are mentioned as "M.D." but he is referred to as "Ph.D."

Senator Murray: After this meeting of the committee that was set up at that time, these medical men who signed this report opposed the voluntary system and advocated the compulsory system. Is that right? Dr. Goin: I could not answer. I do not know. I am not familiar with it.

Senator Murray: I will read it. Dr. Goin: I think it would be of little significance since it is nearly sixteen years since the report was written. A great many things have happened.

[*Later Dr. Goin showed that several of the medical men supporting compulsory health insurance were very largely whole time salaried men who did not actively practise medicine.—Ed. Canad. M. A. J.*]

COSTS OF COMPULSORY INSURANCE

Senator Donnell: Doctor, you were referring to the costs of this compulsory insurance, and I understood your statement to be that it was impossible to determine what it is. I want to call to your attention in that connection, however, one fact that appeared to me was somewhat significant, and that is that you point out that experience elsewhere indicates that there is needed, at least, one employee, not including those actually delivering medical service, for each hundred insured persons. Is that correct? Dr. Goin: That is taken from a citation.

Senator Donnell: From Crownhart on "Sickness in Europe". That is a publication of 1938. Dr. Goin: Yes.

Senator Donnell: You pointed out that on this basis it would need to increase the government payroll by about one and a half million employees. Dr. Goin: Yes.

Senator Donnell: My recollection, Mr. Chairman, is that our esteemed colleague Mr. Byrd has pointed out that there are 3,160,000 governmental employees at this time. So that your judgment is, I take it, from what you state here, that, assuming the facts set forth by Mr. Crownhart to be correct, the number of government employees would have to be increased by something over a third of what are now employed by the government. Dr. Goin: That would seem to be the case.

Senator Donnell: Those, I understand from your statement, do not include the doctors. Dr. Goin: That is right.

Senator Donnell: What would these one million and a half people be? Dr. Goin: They are the clerks and the administrative officers. It is just thousands of employees it takes to administer such a complex thing all over the United States.

Senator Donnell: You would have to have an employee in practically every city of any size in the United States, would you not? Dr. Goin: If I remember correctly, and I probably do not, in prewar Germany the sickness insurance, not including accident insurance, which was administered by a separate institute, had a national institute, thirteen regional institutes and something like thirty-three thousand local offices, each of which obviously has to have at least one employee. In Berlin the main institute is an enormous building comparable to our buildings here in Washington. It must be staffed with thousands of employees.

Senator Donnell: Roughly speaking, are you able to give us an estimate of what grade of salary this million and a half people, other than doctors, would receive? Is $2,000 a year too high for the average? Dr. Goin: I doubt if it is high enough.

Senator Donnell: Say we take $2,000 a year. That would be three billion dollars a year just for the employees, other than doctors. Dr. Goin: That is right.

Senator Donnell: Do you have any idea as to how many doctors would be engaged in this plan? Are you able to estimate at all? Dr. Goin: I hope a very small number, but I could not say.

Senator Donnell: But if the plan became effective, and reasonable opportunity was given for its success, undoubtedly there would be many thousands of doctors in it, would there not? Dr. Goin: I think it would take 150,000 doctors, or more, a good deal more, to administer it.

Senator Donnell: Do you think that it would take nearly all the time of nearly all of those men to administer their duties under this act? Dr. Goin: Goodness, I should think so.

Senator Donnell: What would you be able to estimate the average amount that those men would have to receive per person in order to compensate them adequately for their services? Dr. Goin: There is a deep secret. It was in California too when we had a long series of conferences with officers of the C.I.O., who insisted that they loved the medical profession and wanted to do well with them and thought they did not do well, ought to make more money and have more leisure for vacations, graduate study, research, if they guaranteed this bill. But when we came down to brass tacks, Mr. Minsky, their research expert, thought $5,000 would be ample for any doctor. Of course in England they only get about $2 per person per year, for insured persons.

Senator Donnell: Would your judgment be that $5,000 is certainly not too high? It would be, if anything, considerably too low to compensate for the average professionally equipped man who has put in his time studying for a profession of that type and importance. Dr. Goin: I would think so, although, of course, they get lower salaries than that in the Army and Navy and Public Health Service.

Senator Donnell: Would you think $5,000 a year, on the average, would be a fair estimate as to what they would have to have in order to live in reasonable respectability and commensurate with their position in life? Dr. Goin: I should guess so, because out of this $5,000 they have to maintain their office, assistance, telephone, automobile and supplies.

Senator Donnell: That would look low to me, but I take that figure as a very low figure. That figure would be $750,000,000 a year for the doctors. Now, I should not be a bit surprised if it would be a good bit more than that, would you? Dr. Goin: No.

Senator Donnell: If we take $750,000,000 a year and then take for the clerical employees and others that you have mentioned the one million and a half, three billion dollars, you get up to three billion, seven hundred and fifty million dollars as the cost of operation of this system. Now, with that in mind, Doctor— Dr. Goin: May I say that nearly all the experts think that much too low?

Senator Donnell: What do most of the experts think it would be? Dr. Goin: They think from four to four and a quarter billion dollars for the first year, and the actuarial opinion is that the cost will not begin to level for at least fifty years, and it is very likely to reach ten or twelve billion dollars.

MEDICAL SOCIETIES

Alberta: District Medical Meetings

Dr. Harold Orr, President Elect of the Canadian Medical Association, Alberta Division, has just completed a tour of the various medical districts in the Province. District meetings were held at Camrose, Medicine Hat, Lethbridge, Drumheller, Red Deer, and Dunvegan. Meetings of the Edmonton Rural District and Calgary Rural District were held in Edmonton and Calgary respectively. Attendance was excellent, reaching as high as 85% in Medicine Hat.

The Camrose Medical District meeting was held on May 23. Dr. Orr discussed the medical organization in Alberta, following which he outlined certain changes in regard to the treatment of Venereal Disease in the province. Dr. L. M. Rogers of Camrose, Council representative, discussed the College of Physicians and Surgeons matters, and Dr. D. R. Easton, Department of Veterans' Affairs, outlined the medical care of veterans, Dr. Bramley-Moore led a discussion on Health Insurance. Dr. Walter MacKenzie, Edmonton surgeon, gave a paper on "Ano-rectal lesions". Visitors at this meeting included Dr. Bane from the Department of Veterans' Affairs, Ottawa, and Dr. Douglas Thompson, Vice-president of the New Brunswick society.

Medicine Hat District Medical Society met on Monday, May 27. In the afternoon, papers were given by Dr. Walter MacKenzie, Edmonton, Dr. Max Cantor, Associate Professor of Biochemistry, University of Alberta, and Dr. H. Orr of Edmonton. In the evening, following the dinner, Divisional and College business was discussed. Dr. J. K. Mulloy, Department of Veterans' Affairs, Calgary, outlined the medical treatment of veterans, and Dr. W. Bramley-Moore, Registrar for the College, led the discussion of Health Insurance. A second paper was given by both Dr. MacKenzie and Dr. Cantor. This meeting was attended by a number of physicians from the province of Saskatchewan.

Lethbridge District Medical Society held a dinner meeting on Tuesday, May 28, and was attended by approximately 80% of the doctors in the district. Dr. Orr, as at previous meetings, outlined Divisional matters. Dr. S. M. Rose, Council representative, spoke on the affairs of the College, and Dr. J. K. Mulloy on medical care for veterans. Dr. W. Bramley-Moore spoke on Health Insurance and scientific papers were given by Dr. W. C. MacKenzie and Dr. Max Cantor. The Drumheller District Medical Society met at a dinner meeting on May 30, and the Red Deer District Medical Society met on May 31. At these meetings Dr. A. E. Archer, Lamont, outlined very comprehensively Health Insurance. Other business and scientific papers were as in Lethbridge.

On June 3, the President Elect's party attended a picnic meeting of the Peace River District Medical Society held at Dunvegan. In spite of rain this was attended by over 50% of the doctors in the district, some coming from a distance of more than 150 miles.

A new municipal hospital was opened recently at Oyen. This building will accommodate fifteen patients.

G. E. LEARMONTH.

Prince Edward Island Medical Society

On Tuesday evening, May 21, at the Charlottetown Hotel a dinner meeting, sponsored by the Educational Committee of the Prince Edward Island Medical Society, was largely attended by doctors from the various districts. Dr. E. M. Found presided. Dr. Skinner of Saint John, N.B. was the guest speaker and delivered an address on fractures and dislocations of the hip joint, illustrating his lecture with a choice selection of x-ray plates. Following a discussion period Dr. Skinner was tendered a vote of appreciation and thanks by the Society.

Saint John Medical Society

At the Annual Meeting of the Saint John Medical Society the following slate of officers for 1946-7 was elected: *President*—Dr. J. K. Sullivan; *Vice-president*—Dr. F. R. Connell; *Secretary*—Dr. Stephen Clark; *Treasurer*—Dr. Lachlan McPherson; *Executive Committee*—Drs. N. S. Skinner, Jos. Tanzman, J. P. McInerney; *Representative to N.B. Medical Executive*—Dr. Geo. S. Skinner.

La société médicale des hôpitaux universitaires de Québec

Séance à l'Hôpital du Saint-Sacrement vendredi le 15 février 1946.

MAIGREUR PAR ANOREXIE MENTALE.—Renaud Lemieux et Antonio Martel.

Les auteurs rapportent les observations de trois malades, deux jeunes filles et un jeune homme, dont l'âge moyen est de 25 ans, et qui présentent un syndrôme d'anorexie mentale. Ils signalent les symptômes caractéristiques qui permettent le diagnostic positif de l'anorexie mentale et sa différence de la maladie de Simmonds. Les auteurs font des considérations pathogéniques concernant ces deux affections: la maladie de Simmonds relevant d'une lésion hypophysaire primitive; l'anorexie mentale étant un syndrôme où dominent les troubles psychiques et dont tous les symptômes traduisent l'effet de l'inanition.

Le traitement de l'anorexie mentale doit avoir une double orientation; corriger d'abord le facteur psychoneurotique, puis forcer la ré-alimentation. L'emploi des extraits glandulaires doit se faire secondairement et avec prudence.

MÉNINGITE À BACILLE DE PFEIFFER.—Marcel Langlois, Roland Thibodeau et Marie Rousseau.

Après une revue de la littérature récente sur la thérapeutique des méningites à bacille de Pfeiffer, les

auteurs présentent un cas de méningite de cette nature guérie par l'association de pénicilline et de sulfamidés. En conclusion ils estiment que même si la pénicilline n'a pas eu une action déterminante sur le bacille de Pfeiffer, elle n'a pas été étrangère à la guérison obtenue avec une dose minime de sulfamidés, soit 18 grammes en 58 jours.

ETUDE CLINIQUE ET PSYCHIATRIQUE DE L'HYPERTENSION ARTÉRIELLE.—Sylvio Leblond et Victorien Voyer.

Parmi de nombreux cas d'hypertension artérielle, dite essentielle, chez des jeunes de 20 à 34 ans, clients de l'Hôpital Militaire de Québec, les auteurs en ont particulièrement étudié 20 cas. L'examen clinique s'étant avéré négatif, la plupart de ces patients restaient convaincus de traumatisme pour se l'être fait affirmer tant de fois par leur médecin de famille, au point qu'un état d'invalidité complète à prédominance subjective s'est trouvée établie. C'est alors qu'un examen psychiatrique fut pratiqué sur chacun. Les signes d'instabilité, à part la pression artérielle élevée, seul signe objectif, s'avérèrent tous d'ordre subjectif et névrosique.

Les auteurs, se basant sur les résponses analytiques de chacun de leurs patients, présentent un tableau psychologique saisissant et particulier à la personnalité de l'hypertendu. Ils concluent que dans les cas étudiés, ils ont observé la fixation manifeste dans l'hypertension d'un mode d'expression émotionnelle. Suivent les résultats thérapeutiques dont la psychothérapie dans ses modalités simples jusqu'à la narcose, de laquelle ils ont pu obtenir une réhabilitation chez 12 de leurs sujets. Deux, grâce au concours du Service Social, ont pu voir disparaître la cause de leur invalidité en étant assignés à un emploi convenant à leur attitude psychique. Quatre suivirent une thérapeutique psychiatrique, dont un sous sédation insulinique.

Cette étude est encore à son stage de début et sera poursuivie avec un nouveau groupe de patients à ajouter à la liste actuelle.

Toronto Academy of Medicine

The annual meeting of Toronto Academy of Medicine was held on May 7. Encouraging reports from all departments were presented. Dr. George Boyer was elected President for the coming year and Dr. E. M. Henderson made Vice-president. Dr. Hopkins continues as Honorary Secretary and Dr. K. M. Heard was elected Treasurer.

Toronto East Medical Society

The Toronto East Medical Society held its annual meeting early in May and elected Dr. W. L. Christie President, Dr. E. W. Cummings Honorary Secretary and Dr. W. L. Purvis Treasurer. Belated notice is given to the Ladies' night of this Society held late in March at the Royal York Hotel. A dinner followed by dancing provided a most enjoyable evening. Dr. Devins of Aurora, President of the Ontario Medical Association and Dr. John Stewart President of the College of Physicians and Surgeons of Ontario were speakers at the dinner.

Winnipeg Medical Society

The annual meeting of the Winnipeg Medical Society was held in the Medical College on May 17. The membership of the Society is now the highest in its history. Life Memberships were conferred on the following doctors: J. A. Gunn, W. W. Musgrove, W. A. Gardner, E. A. Jones, and Wm. Turnbull. A Past President certificate was given to Dr. P. H. McNulty. The retiring President, Dr. A. M. Goodwin, gave an interesting address on the founding of Manitoba Medical School in 1883, illustrated with views of the Winnipeg of that day and of the original incorporators. The election of officers resulted as follows: *President*—Dr. Walter F. Tisdale; *Secretary*—Dr. R. A. MacPherson; *Treasurer*—Dr. Cherry Bleeks; *Trustee*—Dr. W. F. Abbott.

ROSS MITCHELL.

MISCELLANY

A Sermon in Wood

There is a door in the Hamilton (Canada) Museum from an old house in that city. The old house, demolished in 1894, had been the residence of a Doctor Case for so many years—and of his father and grandfather—that the door in question had become worn in a fashion which to Sir William Osler, an old friend of the Case family and one who always called to pay his respects when in that part of Canada, was a sermon in wood, so to speak. Sir William wrote an editorial about this symbolic door with the title of "Doctors' Signs" which was published in the *Canadian Medical and Surgical Journal* (**12**: 312, December, 1883). This is what he said about the door's symbolism:

"Happy is the man whose reputation is such or whose local habitation is so well known that he needs no sign! This is sometimes the case in country places and small towns, not often in cities. We know of one such in a prosperous Canadian city. Grandfather, father and son have been in 'the old stand' so long that to the inhabitants of the locality the doctor's house is amongst the things which have always been. The patients' entrance is in a side street and a small porch protects the visitor. The steps are well worn and the native grain is everywhere visible in the wooden surroundings. There is neither bell nor knocker and the door presents interesting and, so far as we know, unique evidences that votaries to this Æsculapian shrine have not been lacking. On the panels at different heights are three wellworn places where the knuckles of successive generations of callers have rapped and rapped and rapped. The lowest of the three, about three feet from the floor, represents the work of 'tiny Tim' and 'little Nell', so often the messengers in poorer families. Higher up and of less extent is a second depression where 'Bub' and 'Sis' have pounded, and highest of all, in the upper panel a wider area where the firmer fists of the fathers and brothers have as the years rolled on worn away the wood to nearly half its thickness. Such a testimony to the esteem and faithfulness of successive generations of patients is worthy of preservation."

Even should left wing state socialism ultimately overwhelm us there will be doors, perhaps many more of them, bearing similar marks of wear and usage, but no Oslers, gifted with insight and sentiment and the art of expressing them, and no Doctor Cases, will be produced by the new social order; they will not be needed, for there will no longer be any deep and precious meaning in the doors such as shines forth in the one memorialized in the Canadian medical journal and the Hamilton Museum.

There will be no *individuals* behind the doors of the future and no reason for placing such doors in museums—if political medicine has its way.—From *Medical Times*, September, 1945.

Whatever else Mussolini did, he built the Italian nation fine hospitals. The one we were stationed near, though bomb-chipped, was modern and well equipped. At our first visit our greatest difficulty was in distinguishing the medical staff from the male attendants. Custom and the razor-blade shortage had combined to cover all in a three-day stubble, and all wore white coats. After discussing gastrectomies for half an hour with a perplexed and inarticulate floor-sweeper, or asking the doctor sharply for our hats, we finally discovered the technique of opening a conversation with a raised eyebrow and a questioning "Professore?" They either shook your hand enthusiastically or found you one.

Our guide, a young intelligent doctor, invited us to see the professor at work. The theatre was equipped with every type of auxiliary apparatus and tiled in pastel shades. Students peering down through the plexiglass roof could see the professor commencing the fifth gastrectomy of the morning. In accordance with the Continental anæsthetic routine, the patient, after 'Omno-

pon' and scopolamine, received a somewhat perfunctory abdominal infilteration of local anæsthetic. She complained stridently, realeasing a quick burst of "mamma mia's". At a nod from the surgeon a mask was clapped over her face and ether lavishly poured on. The anæsthetist was a little raw and nervous but succeeded finally in stilling the yells. Being in doubt as to the depth of the patient he called over a colleague, "un assistente," who, without more ado, retracted the woman's lids, took out his cigarette lighter, and struck it—presumably to test the pupillary reaction. The quick explosive flash and the stimulation of the burning mask proved the patient to be adequately deep.

The spirit of incendiarism was even more rife at our next visit. Open ether was again given and the patient was soon smoothly relaxed, but the professor, feeling a little chilly that morning, instructed a nun to switch on the electric fire in the far corner of the theatre. A few minutes elapsed before the slow sweeping waves of ether reached the hot wire. This time the explosion was tremendous and altogether too much for the staff, who took to their heels and fled, leaving the patient quietly burning on the table. It says much for the battle training of our anæsthetist that, crawling from his hiding, he controlled the spreading flames. Nobody was hurt and the patient didn't turn a hair.

This martial experience cemented our friendship with the younger assistentes and we had the opportunity of studying the inner mechanisms of a modern Italian teaching hospital. On the positive side we found the staff much more widely read and erudite than their English counterparts. They new intimately a great deal of German, French, and American medical literature. British medicine doesn't rank very highly with them: one in fact said, "Penicillin is the only discovery that you have made since Harvey's time". Technically they were slick but too inclined to perform an operation for its mechanical beauty rather than the patient's good. The number of gastrectomies, all superbly done, following a history of a few months' dyspepsia and a doubtful x-ray finding, was incredible. There was, of course, no follow-up system.

The nursing, in the hands of the nuns, was deplorable; the ward dressings, done by a surgeon smoking a cigarette, were pre-Listerian. Local anæsthesia was roughly and hurriedly achieved, and open ether was the only substitute except a German machine that nobody could work. Since they have no degree comparable to FRCS, Italians depend for their surgical maturation on the production of innumerable papers. Our guide of the first day, though only 27, had 25 papers to his credit. These are too often merely chunks of bibliography with trivial original material. Perhaps it is all a matter of national temperament. As our cheerful and prolific guide said, "We are so much more romantical". —From "In England Now", *The Lancet*, October 6, 1945.

CANADIAN MEDICAL WAR SERVICES

MEDICAL OFFICERS APPOINTED TO THE R.C.A.M.C. — ACTIVE FORCE

APRIL 1946

(Previous sections in January, March, April, May, June, July, September, October, November and December, 1945 and January, March, May, June, 1946.)

SECTION LXXIII

Name and Address	*Date of Appointment*	*Name and Address*	*Date of Appointment*
Hahn, C. E., 36 Strath Ave., Toronto	23-2-46	Knox, R. E., 734 West 13th Ave., Vancouver	7-3-46
Kucherepa, J. W., 268 High Park Ave., Toronto	19-2-46	Zed, V. M., 225 Prince Edward St., Saint John, N.B.	18-2-46

MEDICAL OFFICERS STRUCK OFF STRENGTH OF THE R.C.A.M.C.—ACTIVE FORCE

APRIL 1946

SECTION LXXIV

Name *Address*	*Date struck off strength*	*Name* *Address*	*Date struck off strength*
Achim, R. M. B., 3794 Blvd. Perras, Montreal	4-4-46	Banchart, A. W., 508 Wellington St., London, Ont.	29-3-46
Acker, M. S., 483 Manning Ave., Toronto	27-3-46	Banfill, S. M., Cookshire, Que.	1-3-46
Acker, T. B., 108 Henry St., Halifax	29-3-46	Belanger, J. C., Apt. 1, 824 Cherrier St., Montreal	2-4-46
Aikenhead, J. F., 710 Prospect Ave., Calgary	11-3-46	Benson, J. B., 126 Walton St., Port Hope, Ont.	16-3-46
Alexandroff, M., 178 Geneva St., St. Catharines, Ont.	19-3-46	Berbrayer, P., Winnipeg	20-3-46
Allen, L. P., 208 St. Olivier, Que.	25-3-46	Berezan, D., Vegreville, Alberta	5-3-46
Armstrong, J. B., 46 Jackes Ave., Toronto	28-3-46	Berry, J. V., 286 Carling Ave., Ottawa	16-3-46
Armstrong, J. D., 13 Humber Trail, Toronto	28-3-46	Black, G. M., Swansea Gen. & Eye Hosp., Swansea, Wales	1-3-46
Atwood, H. K., 189 Rosedale Heights Dr., Toronto	7-3-46	Black, J. H., Wells, B.C.	15-3-46
Avren, S. S., 416 McKenzie St., Winnipeg	6-3-46	Borland, K. R., 17 Indian Trail, Toronto	4-3-46
Bagnall, A. W., 215 College St., Toronto	2-3-46	Brady, P. L., Wilson Ave., Box 396, Seaforth, Ont.	14-3-46
Baker, A. A., 79 Rosemount Ave., Weston, Ontario	18-3-46	Brown, J. E., Richmond, Ont.	23-3-46
Balfour, J., Royal Victoria Hosp., Montreal	20-3-46		
Ball, N. J., Oliver, B.C.	21-3-46		

Name	*Address*	*Date struck off strength*
Buchanan, D. R.,	938-13th St. S., Lethbridge, Alta.	9-3-46
Cahill, F. C.,	10 Wilson St., Perth, Ont.	25-3-46
Calnek, S. H.,	161 Charlotte, Saint John, N.B.	12-3-46
Cameron, D. G.,	Montreal Gen. Hosp., Montreal	23-3-46
Campbell, E. B.,	115 Broadview Ave., Toronto	20-3-46
Carette, L.,	235 Wolf. St., Levis, Que.	20-3-46
Carnat, M.,	Prov. Mental Hosp., Ponoka, Alta.	3-4-46
Carscallen, H. B.,	179 Lake Shore Rd., Humber Bay, Ont.	1-4-46
Carson, G. D.,	Vulcan, Alta.	6-4-46
Chase, L. A.,	No. 50, Qu'Appelle Apts., Regina	19-3-46
Christensen, H. F.,	Box 105, Standard, Alta.	6-3-46
Christie, H. L. E.,	111 Church St., Amherst, N.B.	4-3-46
Clairmont, G.,	198 St. Charles St., St. John's, Que.	12-3-46
Clare, W. H.,	Homewood San., Guelph, Ont.	30-3-46
Clarkson, M. F.,	17 Robinwood Ave., Toronto	9-3-46
Cody, L. C.,	173 Chatham St., Brantford, Ont.	21-2-46
Cohen, H.,	373 Jarvis Ave., Winnipeg	13-3-46
Cohen, S.,	3 Humewood Drive, Toronto	29-3-46
Colthart, J. M.,	Toronto East Gen. Hosp., Toronto	4-4-46
Comrie, C. L.,	Culrose, Man.	6-3-46
Copping, G. A.,	504 Lansdowne, Westmount, Que.	3-4-46
Couper, W. M.,	4675 Roslyn Ave., Montreal	15-3-46
Cowle, J. E.,	898 Queen St. E., Toronto	19-3-46
Cragg, B. E.,	46 2nd Ave., Ottawa	21-3-46
Cruickshank, W. H.,	68 Fallingbrook Rd., Toronto	25-3-46
Crux, N. W. G.,	9648-106th Ave., Edmonton	13-3-46
D'Amours, O.,	31 D'Artigny St., Que.	19-3-46
Dargis, J.,	791 Niverville St., Three Rivers, Que.	25-3-46
Day, J. C.,	9822-107th St., Edmonton	6-3-46
Decter, P. H.,	Winnipeg	28-2-46
Delaney, W. L.,	30 Garden St., Quebec City	13-3-46
Dereniwski, E. A.,	Mikado, Sask.	23-2-46
Dickison, J. C.,	4462 Western Ave., Westmount, Que.	26-3-46
Dowd, G. C.,	561 Jarvis St., Apt. 5, Toronto	15-3-46
Drummond, K. L.,	101 College St., Toronto	14-3-46
Duggan, J. W.,	443-1st St., Medicine Hat, Alta.	19-3-46
Edmison, E. R.,	38 Rose Park Drive, Toronto	6-3-46
Eisen, S. M.,	806 Euclid Ave., Toronto	28-3-46
Elliott, A. J. K.,	Olds, Alta.	5-3-46
Elliott, H. W.,	Montreal Neurological Inst., Montreal	1-4-46
Evoy, G. H.,	264 Edmonton St., Winnipeg	4-3-46
Ewing, D.,	973 King St. W., Kitchener, Ont.	18-3-46
Falkner, K. C.,	304 Waverly St., Ottawa	25-3-46
Fenwick, C. P.,	202 Rosedale Heights Dr., Toronto	2-2-46
Fitzosborne, D. J.,	427 W. 49th Ave., Vancouver	9-3-46
Ford, H. S.,	3023 Uplands Road, Victoria	20-3-46
Foster, H. E.,	856 Carlaw Ave., Toronto	4-4-46
Foy, E. F.,	12508-106th Ave., Edmonton	13-3-46
Fraser, J. H.,	Cobden, Ont.	9-3-46
Fraser, J. T. M.,	170 Carleton Ave., Ottawa	6-3-46
Fratkin, L. B.,	Edmonton	8-3-46
Freebury, W. H.,	10557-86th Ave., Edmonton	30-3-46
Gabel, F. E. J.,	39 Betts Ave., Yorkton, Sask.	1-3-46
Gain, E. A.,	1114-9th St. E., Calgary	22-3-46
Gibbons, A. K.,	Edmonton	26-3-46
Giberson, H. R. G.,	Sheet Harbour, N.S.	7-3-46
Gillespie, H. S.,	338 Catherine St., Fort William, Ont.	3-4-46
Gosse, C. L.,	St. Luke's Hosp., Cleveland, Ohio	23-2-46
Graham, G. G. K.,	118 29th St., Saskatoon	25-3-46
Gray, G. C.,	c/o C. S. Buck, Port Rowan, Ont.	10-1-46
Gregorie, G.,	Berthierville Co., Berthier, Que.	6-3-46
Grenz, A. H.,	Lipton, Sask.	19-2-46
Groves, K. P.,	1426 W. 48th Ave., Vancouver	12-3-46
Guttormsson, V. J.,	Lundar, Man.	2-3-46
Guy, A. M.,	12 Deanery Ave., St. John's, Nfld.	2-3-46
Haddad, J. W.,	134 Adie St., Sudbury, Ont.	30-3-46
Haddad, N. N.,	Sudbury, Ont.	2-3-46
Hall, R. M.,	1062 Dovercourt Rd., Toronto	6-4-46
Hamer, H. E.,	Revelstoke, B.C.	19-2-46
Hamilton, E. F. B.,	South Porcupine, Ont.	22-1-46
Hamlin, J. H.,	136 Powell Ave., Ottawa	28-3-46
Hanson, S.,	100 College St., Toronto	19-3-46
Hare, J. H.,	Newcastle, Ont.	14-3-46
Harper, R. R.,	1916 Athol St., Regina	6-4-46
Harrigan, E. R.,	133 Brookland St., Sydney, N.S.	9-3-46
Harris, G. E.,	Amherstburg, Ont.	19-3-46
Hawthorne, K. O.,	2702 Pie IX, Montreal	26-3-46
Helem, E. V.,	Medora, Man.	23-3-46
Henderson, W. E.,	Holland Centre, Ont.	2-4-46
Hendleman, M.,	508 Bloomfield Ave., Montreal	21-3-46
Herbin, C. A.,	Lockeport, N.S.	22-3-46
Herstein, A.,	3815 West 10th Ave., Vancouver	19-3-46
Holley, W. J.,	59 Hydro St., London, Ont.	23-2-46
Hood, A. M.,	2001 Bloor St. W., Toronto	29-3-46
Houston, A. B.,	937 Warsaw Ave., Winnipeg	16-3-46
Howden, W. A.,	271 Beaverbrook St., Winnipeg	13-3-46
Hudson, P. W.,	193 Dockerell St., Trail, B.C.	21-3-46
Hurtig, A.,	11218-100 Ave., Edmonton	16-3-46
Inglis, W. A. N.,	331 Clarke Ave., Westmount, Que.	29-3-46
Jamison, C. A.,	1310 W. 11th St., Calgary	12-3-46
Jasper, H.,	427 Mt. Stephen Ave., Westmount, Que.	21-3-46
Johnston, K. M.,	335 Berkeley St., Toronto	27-3-46
Jones, N. H.,	Port Alberni, B.C.	22-3-46
Kahn, D. S.,	Regina Grey Nuns Hosp., Regina	21-3-46
Kahne, H. M.,	Montreal	6-3-46
Kark, R. M.,	173 Walnur St., Brookline, Mass., U.S.A.	8-3-46
Kasian, P.,	276 Melrose Ave., Transcona, Man.	18-3-46
Katz, M.,	332 Ave. F.S., Saskatoon	3-4-46
Kelly, G. C.,	210 Victoria Ave. N., Hamilton, Ont.	12-3-46
Kelly, J. R.,	106 Ninth St., Brandon, Man.	25-3-46
Kirk, D. K.,	421 East 48th Ave., Vancouver	11-3-46
Kitchen, G. H.,	(no address available)	29-3-46
Kling, S.,	Swift Current, Sask.	29-3-46
Kneale, H. A.,	90 Lorne Cresc., Brantford, Ont.	18-3-46
Laing, W. A. R.,	44 Windsor Ave., Westmount, Que.	7-3-46
Landa, S.,	225-6th St., Saskatoon	3-4-46
Larue, R.,	59½ St. Cyrille St., Quebec	15-3-46
Lederman, J.,	326 Rushton Rd., Toronto	13-3-46
Lefebvre, G. T. G.,	Huntingdon, Que.	21-3-46
Lemieux, R. R.,	Noranda, Temiskaming, Que.	28-3-46
Lesage, J. B.,	5317 Verdun St., Verdun, Que.	28-2-46
Letellier, E. H.,	Lac Megantic, Que.	1-4-46
Leveille, B. A.,	Chambly Basin, Que.	27-2-46
Levy, I.,	9 Euclid Ave., Toronto	15-3-46
Lind, J. R.,	Toronto	30-3-46
Lindsay, J. H.,	Toronto Western Hosp., Toronto	22-3-46
Lussier, J. J.,	7839 Foucher St., Montreal	22-3-46
MacCormick, J. A.,	52 Dublin St., Halifax	14-3-46
McEachern, K. D.,	7 Pine Crescent, Toronto	28-2-46
McFetridge, S. A.,	3937 Osler Ave., Vancouver	16-3-46
McGovern, J. E.,	66 Dorchester St., Montreal	12-3-46
McGregor, K. M.,	Ontario Hosp., Kingston, Ont.	22-3-46
MacGregor, H. I.,	2 Churchill Drive, Halifax	7-3-46
MacGuire, H. C.,	202 S. Perry St., Montgomery, Alabama, U.S.A.	3-4-46
MacIntosh, R. A.,	Andover, N.B.	3-4-46
MacKay, I. M.,	383 Sherbourne St., Toronto	27-3-46
McKee, D. B.,	1150 W. 2nd Ave., Owen Sound, Ont.	29-3-46
McKenty, J.,	121 Cirton Blvd., Tuxedo, Man.	28-3-46
MacLeod, D. R. E.,	166 Oakmount Rd., Toronto	28-3-46
MacLeod, L. A.,	197A Brookside St., Glace Bay, N.S.	14-3-46

Name	*Address*	*Date struck off strength*
McNab, J. A.,	Vancouver	12-3-46
MacNeill, D. C.,	164 Cumberland St., Toronto	16-3-46
McNicoll, A.,	La Malbaie, Charlevoix Co., Que.	25-3-46
McQuay, N. W.,	24 Stuart St., Kingston, Ont.	22-3-46
Marcellus, D. F.,	87 Fairleigh Ave., South Hamilton, Ont.	18-2-46
Maroosis, J. P. G.,	Paris, Ont.	3-4-46
Martin, J. H.,	Neepawa, Man.	13-3-46
Mathe, C. J.,	8 Wilfred Ave., Toronto	6-4-46
Maxwell, J. A.,	No. 5 Goderich Apts., Calgary	5-3-46
Megas, C.	(no address known)	6-4-46
Meth, B.,	Ioco, B.C.	27-3-46
Michalski, A.,	20 Sherman Ave. N., Hamilton, Ont.	15-3-46
Miller, J. S.,	63 Larch St., Halifax	17-1-46
Monteith, J. S.,	Balcarras, Sask.	19-3-46
Montemuro, T.,	122 Minto St., Sudbury, Ont.	13-3-46
Montgomery, L. C.,	4469 Montrose Ave., Westmount, Que.	29-6-45
Morden, J. R. E.,	72 Lincoln Ave., Brantford, Ont.	13-3-46
Morin, L. P.,	Windsor Mills, Richmond Co., Que.	22-3-46
Mottram, L. E.,	Apt. 3, 268 Vaughan Rd., Toronto	25-1-46
Murphy, H. R.,	533 Catherine St., Fort William, Ont.	4-3-46
Murray, F. S.,	Box 39, North Battleford, Sask.	27-3-46
Neville, J. W.,	405 West 14th Ave., Vancouver	15-3-46
Nix, N. W.,	10219-115th St., Edmonton	1-3-46
Norry, H. T.,	Royal Victoria Hosp., Montreal	21-3-46
O'Connor, L. N.,	176 Johnston St., Kingston, Ont.	28-3-46
O'Connor, M. J.,	Kingston, Ont.	2-4-46
Olacke, F. A.,	Ashcroft, B.C.	12-3-46
O'Meara, M. W. H.,	611-15th St. S., Lethbridge, Alta.	15-3-46
Oughtred, O. W.,	R.R. 2, Cainsville, Ont.	4-4-46
Pakozdy, S. P.,	233 King St., Welland, Ont.	14-3-46
Parker, R. G.,	Watford, Ont.	25-3-46
Parks, A. E.,	84 Poplar Plains Cresc., Toronto	12-3-46
Patton, J. O.,	106 Harmer, Ave., Ottawa	23-3-46
Pearce, J. P.,	Parry Sound, Ont.	26-3-46
Perron, S.,	1178 Mountain St., Montreal	16-3-46
Pilcher, F.,	621 Sifton Blvd., Calgary	12-3-46
Prince, J. S.,	430 W. 116th St., New York	15-3-46
Quigley, G. J. J. S.,	165 Roehampton Ave., Toronto	28-3-46
Rabson, L. R.,	365 Queenston St., Winnipeg	4-3-46
Racine, J. A. R.,	65 Labelle, L'Abord a Plouffe, Que.	15-3-46
Rance, C. P.,	273 Oriole Parkway, Toronto	26-3-46
Redpath, E. L.,	Souris, Man.	15-3-46
Reed, W. A.,	Montreal Gen. Hosp., Montreal	27-2-46
Richardson, C. A.,	107 Renfrew Ave., Ottawa	20-3-46
Rigg, F. J.,	Niagara-on-the-Lake, Ont.	21-3-46
Ripstein, R. B.,	3474 Cote des Neiges Rd., Montreal	7-3-46
Robert, J. M. P. E.,	966 Cherrier St., Montreal	7-3-46
Roberts, C. A.,	P.O. Box 843, St. John's, Nfld.	23-3-46
Robinson, C. E. G.,	R.R. 2, Pembroke, Ont.	6-3-46
Robinson, H. E.,	Brampton, Ont.	16-3-46
Roderick, J. H.,	Ancaster, Ont.	13-2-46
Rogers, J. R.,	59 King St., Ingersoll, Ont.	4-2-46
Rose, P. B.,	10324-121st St., Edmonton	7-3-46
Ross, J. A.,	Stellarton, N.S.	1-1-46
Ruskin, S. G.,	326 Lansdowne Ave., Winnipeg	5-3-46
Rutherford, P. S.,	Iroquois Falls, Ont.	14-3-46
St. Amand, G.,	43 Racine St., Loretteville, Que.	11-3-46
Salkin, I.,	75 Maria St., Toronto	14-3-46
Scratch, J. R.,	Freemont, Sask.	26-1-46
Sears, C. F.,	St. Stephen, N.B.	3-4-46
Share, M.,	University Hosp., Edmonton	19-3-46
Shea, W. A.,	St. Louis, P.E.I.	26-2-46
Shepherd, G. H.,	69 St. Louis Ave., Riverside, Ont.	25-3-46
Sheps, C. G.,	706 Osborne St., Winnipeg	18-3-46
Shirley, S. Y.,	90 Queen St., Halifax	6-3-46
Sinclair, J. A.,	10958-87th Ave., Edmonton	14-3-46
Skinner, F. L.,	821 University Dr., Saskatoon	15-3-46
Smith, R. L.,	3730 Queen Mary Rd., Apt. 5, Montreal	20-3-46
Southcott, F. R.,	R.R. 4, Highland Road, London, Ont.	13-3-46
Sparling, F. N.,	70 Niagara St., Winnipeg	15-3-46
Spaulding, W. B.,	4 Elm Ave., Toronto	7-3-46
Spittel, W. H.,	102 Briar Hill, Toronto	28-3-46
Stanyon, J. H.,	268 Larch St., Sudbury, Ont.	8-3-46
Steindel, L. C.,	Box 174, Cloverdale, B.C.	21-3-46
Stevenson, A. C.,	1316 Ave. D, Gothenburg, Nebraska, U.S.A.	5-3-46
Stevenson, R. H.,	43 Westminster Ave., Montreal	25-3-46
Straker, M.,	Ontario Hospital, Whitby, Ont.	26-3-46
Stubbings, R. S.,	Toronto	4-3-46
Tchaperoff, I. C. C.,	4726 Belmont Ave., Vancouver	9-3-46
Telfer, G. W.,	24 Sydenham St., Kingston, Ont.	22-3-46
Thoms, A. E.,	Box 166, Madoc, Ont.	30-3-46
Thompson, J. A. D.,	10235-122nd St., Edmonton	12-3-46
Tomaskewsky, E. E.,	Andrew, Alta.	19-3-46
Tompkins, A. D.,	414-11th St., Saskatoon	3-4-46
Toms, A. A.,	128 Evanson Ave., Winnipeg	13-3-46
Tucker, J. B.,	Star City, Sask.	28-3-46
Varverikos, E.,	224 Roy St. East, Montreal	5-3-46
Vasque-Cruz, J.,	Apt. 8, 4478 St. Catherine St., Montreal	11-3-46
Wagman, B. B.,	25 Walmer Rd. N., Toronto	23-2-46
Wakefield, G. E.,	132 Elm St., Winnipeg	9-3-46
Walker, C. E.,	Wainfleet, Ont.	6-3-46
Wallingford, W. W.,	Perkins, Que.	20-3-46
Walsh, C. J.,	St. John's, Nfld.	22-3-46
Waslenki, A. J.,	Sedley, Sask.	15-3-46
Wasserman, M. M.,	1933 St. John's St., Regina	18-3-46
Waugh, G. A.,	Carberry, Man.	1-3-46
Weaver, H. G.,	Vancouver Gen. Hosp., Vancouver	29-3-46
White, H. E.,	3375 Oak St., Vancouver	1-3-46
Whitman, R. L.,	Vancouver Gen. Hosp., Vancouver	11-3-46
Whyte, W. D.,	114-10th St. W., Owen Sound, Ont.	14-3-46
Wilson, G. E.,	999 Queen St. W., Toronto	30-3-46
Winram, R. G.,	Royal Alexandra Hotel, Winnipeg	13-3-46
Wise, D. K.,	41 Hillcrest Dr., Toronto	18-3-46
Wolfe, G. W.,	Court House, Kenora, Ont.	13-3-46
Wood, G. W.,	2471 Mayfair Ave., Montreal	5-3-46
Woodman, F. L.,	11024-86th Ave., Edmonton	9-3-46

"He would be no honest and successful pilot who was to apply himself with less industry to avoid rocks and sands and bring his vessel safely home than to search into the causes of the ebbing and flowing of the sea, which, though very well for a philosopher, is foreign to him whose business it is to secure the ship. So neither will a physician, whose province it is to cure diseases, be able to do so, though he be a person of great genius, who bestows less time on the hidden and intricate method of nature, and adapting his means thereto, than on curious and subtle speculation."—Thomas Sydenham.

SPECIAL CORRESPONDENCE

The London Letter

(From our own correspondent)

The National Health Service Bill

As the Bill makes its way through Parliament it is becoming increasingly clear that the one outstanding problem to be solved is how to effect a satisfactory compromise between the necessity for adequate Ministerial control on the one hand, and the preservation of the professional freedom of the individual doctor on the other. The Minister of Health has consistently maintained that as he will be responsible to Parliament for the efficient working of the new medical service, he must have adequate powers, and in resisting any amendments that might limit these powers he has equally consistently promised to consult the medical and hospital authorities before making any directives. The Opposition has not been slow to point out that such promises do not carry the weight of an Act of Parliament or of a departmental regulation. The only practical solution is probably to be found in a reduction of Ministerial control to a minimum and at the same time to maintain the maximum of flexibility. Centralization with a maximum of regional initiative is the type of compromise in which this country has specialized throughout the ages, and there is no reason why our national genius in this particular direction should fail us at this moment. An interesting indication of how the wind is blowing is the resolution passed last month by the Royal College of Physicians of London "acknowledging the urgent necessity for reorganization of the hospital service and approving the principles of the relevant proposals of the National Health Service Bill".

The Spen's Report

The long-awaited report of the committee appointed by the Minister of Health in 1945 to advise upon the remuneration of doctors in a publicly organized service, has had a favourable reception from the profession and has been approved by the B.M.A. The Government's reaction to it has not yet been divulged. The essence of the report is that in the age-group 40-49, approximately three-quarters of general practitioners should have an income of over £1,000 per annum, approximately one-half should have an annual income of over £1,300, a quarter should have over £1,600, while slightly less than a tenth should have £2,000 a year or over. These figures are based upon the earnings of doctors in 1936-38. Whilst it was not within the province of this committee (named, incidentally, after its distinguished chairman, Sir William Spen, Master of Corpus Christi College, Cambridge) to advise upon how this income should be made up, several methods are mentioned. The bulk of the income would come from capitation fees, but in order to award initiative and professional zeal, it is suggested that a bonus of £100 might be paid for attendance at a refresher course, while "supervision fees" might be paid to successful practitioners who took on younger men as assistants. The cost of these proposals is estimated to be 15s. 6d. per head, on the assumption that the number of persons covered by the service is 45,000,000.

Hospital Celebrations

Two famous London hospitals and a famous mental home have been in the news recently. Last month the King and Queen attended the celebrations of the 400th anniversary of the second foundation of St. Bartholomew's Hospital. Originally founded in 1123, "Bart's", as it is affectionately known, fell on evil days in the reign of Henry VIII. In 1546 this notorious monarch was persuaded to grant a royal charter for its refoundation, and it is this historic occasion that has just been celebrated with due pomp and circumstance. Much younger in years, the Middlesex Hospital has just been celebrating its bicentenary with a series of addresses by the President of the Royal Society, the Secretary of the Medical Research Council and Sir Lionel Whitby, a distinguished son of the hospital who was recently appointed to the Regius Chair of Physic at Cambridge. The third celebration is the 150th anniversary of The Retreat, the famous mental hospital at York founded by William Tuke in May 1796 under the ægis of the Society of Friends. This was the first institution of its kind in this country to initiate humane treatment of mental illness, and the Society can look back with pride to the tremendous impetus they gave to what is now accepted as the only possible method of dealing with the mentally unstable.

Rehabilitating European Libraries

At an interesting meeting organized by the Royal Society of Medicine last month Mr. Aneurin Bevan, the Minister of Health, gave his blessing to a scheme that has been evolved by the Society for the rehabilitation of the devastated medical libraries of Europe. The paper is not available to provide these libraries with the books and journals which they need so badly, and it has therefore been proposed that the Society should make microfilms of medical periodicals and books that have been published in this country during the 1939-45 war, and distribute these throughout the devastated countries of Europe. The scheme, which is largely financed by a generous grant from the Rockefeller Foundation, has been approved by the publishers of the country, so that in a short time it should be well under way. No one who attended this meeting could fail to be touched by the accounts given by the Ambassadors of Yugoslavia and Denmark and the representatives of Russia, Czecho-Slovakia, Poland, France and Holland, of the thirst for medical knowledge in their countries and the complete inability to satisfy this thirst because of the destruction wrought upon their libraries. Our new Minister of Food has recently referred to "the bell of hunger and famine tolling for many parts of Europe". It is not only physical hunger and famine that are casting their blight upon Europe, and this welcome move on the part of the Royal Society of Medicine will go far towards satisfying the hunger for the things of the mind and of the spirit.

London, June 1946. WILLIAM A. R. THOMSON.

ABSTRACTS FROM CURRENT LITERATURE

Medicine

Treatment of Tuberculosis of the Larynx with Streptomycin. Report of a case. Figi, F. A., Hinshaw, H. C. and Feldman, W. H.: *Staff Meet. Mayo Clinic,* **21:** 127, 1946.

This report concerns a 32-year old woman with tuberculous involvement of both vocal cords demonstrated by biopsy, with tubercle bacilli in the sputum, but no parenchymal pulmonary tuberculosis. There was some accentuation of the right hilar shadow in the roentgenogram of the thorax "such as might be produced by enlargement of hilar lymph nodes". Hoarseness had been present for one year. "The entire glottis was involved by a papillary thickening which was most marked on the right vocal cord. Except for slight limitation of movement of the right arytenoid, the laryngeal picture was typical of papillary tuberculous laryngitis."

Treatment with streptomycin was carried out for six weeks by intramuscular and subcutaneous injection (800,000 to 1,000,000 S units (0.8 to 1.0 gm.), per 24 hours in 8 equal doses q. 3 h.); and by inhalation of nebulized ærosol solution (0.5 gm. streptomycin hydrochloride in 30 c.c. normal saline, 3.0 c.c. of this being

administered at the beginning of each hour for 10 hours each day).

Definite improvement was noted by 10th day; 75% improvement estimated by the 24th day and complete healing in 6 weeks. Examination in 3 months revealed negative findings. By correspondence 1 year later patient reported that she was symptom-free and in good health. A. L. JOHNSON.

Treatment of Hypersensitiveness to Cold with Benadryl. Report of a case. Notier, V. A. and Roth, G. M.: *Staff Meet. Mayo Clinic*, **21:** 170, 1946.

A white woman aged 44 had shown marked hypersensitivity to cold since the age of 6. The manifestations of exposure were itching, burning, erythema and later swelling of skin of hands, face and legs: dyspnœa occurred on breathing cold air and ice cold foods were difficult to swallow. At age 18 she developed characteristic symptoms of duodenal ulcer. This was demonstrated by x-ray on the present admission.

After a hand was immersed in ice water at 10° C for 6 minutes the following changes occurred: pallor with burning and tingling in the immersed area, subsequent redness on removal from the water, then a white mottling with marked swelling so that the hand could not be closed. After 17 minutes there was a marked line of demarcation between the exposed portion and the unexposed portion. The reaction lasted 30 hours. There was no change in blood pressure and no subjective systemic reaction. Similar exposure of the face resulted in the same chain of events.

Improvement was noted with treatment in which benadryl was given (50 mgm. four times daily for 18 days). The response to the cold test was estimated as showing 50% improvement. On follow-up with patient taking 50 mgm. of benadryl twice daily for 1 month, the response to cold was still about 50% less than before treatment, but two weeks after cessation of the drug the degree of improvement began to decrease.

It is of interest that the ulcer symptoms were aggravated during the cold season of the year. The authors' estimate is that "benadryl does not appear to be a particularly effective therapeutic measure for the syndrome of hypersensitiveness to cold especially when a duodenal ulcer is present, at best, 50% improvement was observed in the patient, but this improvement was only temporary". A. L. JOHNSON.

Low-sodium Diet and Free Fluid Intake in the Treatment of Congestive Heart Failure. Bridges, W. C., Wheeler, E. O. and White, P. D.: *New England J. Med.*, **234:** 573, 1946.

Sufficient restriction of the dietary sodium (to levels of 700 to 1,000 mgm., which is the equivalent of 1.75 to 2.63 gm. of sodium chloride, per day) will have a markedly beneficial effect upon œdema even if water is freely ingested. The low-sodium diet does not replace rest, digitalis and diuretic therapy in the treatment of congestive failure but it is a valuable adjunct and should have much more general usage. To ensure a low-sodium diet no salt or soda must be used in cooking, at the table, in medicinal agents or in salt substitutes. Bread must be prepared salt-free as must butter (or the latter washed free of salt).

The advantages of the low-sodium diet are three-fold, its efficacy in many obstinate cases of œdema which have not responded to other measures, the lessened frequency of injections of mercurial diuretics and the fact that the liberal intake of fluid does away with thirst. The disadvantages are the difficulty in preparation of the diet and its flat taste.

The authors have studied the effects of the low-sodium diet in 64 patients. Results in 17 are not included because of lack of patient co-operation or because of insufficient data. Of the remaining 47 cases 17 were markedly benefited, 8 received slight help and no improvement resulted in 7 patients. NORMAN S. SKINNER.

The Wolff-Parkinson-White Syndrome. Boyer, N. H.: *New England J. Med.*, **234:** 111, 1946.

The Wolff-Parkinson-White syndrome, an electrocardiographic pattern consisting of a short PR interval with a prolonged QRS, is not rare among young adults but is still frequently misinterpreted as indicating myocardial damage. Electrocardiograms on 1,356 army-patients showed it to be present in seven, an incidence of 0.5%.

The generally accepted theory of causation, the presence of aberrant conduction tissue between auricle and ventricle, is not a satisfactory explanation since multiple precordial leads fail to show early excitation of one or the other ventricle. Although increase in vagal tone can produce the same pattern in normal individuals this does not explain the Wolff-Parkinson-White syndrome since the latter tends to spontaneously disappear in later life at a time when vagal tone increases.

In the seven cases reported in detail two had paroxysmal tachycardia, three neurocirculatory asthenia, one schizophrenia and the remaining case was symptomless. This frequency of psychoneurosis may indicate that a deranged nervous system is related to etiology. It also demonstrates the importance of proper recognition of the benignity of the syndrome so that cardiac neurosis may be avoided. NORMAN S. SKINNER.

Coarctation of the Aorta. Friedenberg, R. and Sokol, A. J.: *New England J. Med.*, **234:** 552, 1946.

Coarctation of the aorta possesses four major diagnostic criteria, erosions of the rib margins; absence of the aortic knob and dilatation of the ascending aorta; a high blood pressure limited to the upper extremities; a loud systolic murmur audible over the manubrium sterni and in the left interscapular area; and pulsations of the subscapular, intercostal and internal mammary arteries. Almost any of these four features may be absent in the individual case, dilatation of the ascending aorta being the most constant radiologic finding with high blood pressure in the upper extremities being the most uniform physical finding. With a well established collateral circulation there may be no difference between the pulse volume and blood pressure in the upper and lower extremities.

There is nothing pathognomonic about the murmur of coarctation since its character varies in different cases. As a rule the pulsation in the enlarged collateral vessels is readily apparent.

The diagnostic importance of diminished or absent femoral pulsation has been over-emphasized, as coarctation not infrequently exists without this abnormality, as in two cases presented. NORMAN S. SKINNER.

Serial Prothrombin Estimations in Cardiac Patients: Diagnostic and Therapeutic Implications; Use of Dicoumarol. Cotlove, E. and Vorzimer, J. J.: *Ann. Int. Med.*, **24:** 648, 1946.

No effect on the whole or diluted plasma prothrombin time was observed in a group of 18 cardiac patients who received digitalis for varying periods of time. A review of the literature revealed no definite evidence that digitalis administered to patients in therapeutic doses has the effect of promoting thrombosis or embolism. Digitalis should be used in heart failure where indicated, since the control of failure is a factor in the avoidance of thrombo-embolism.

In the cases of coronary occlusion, as well as those with repeated attacks of angina pectoris, there was no characteristic alteration in prothrombin activity. One case developed myocardial infarction following pulmonary infarction on two occasions; during one of these there was evidence of increased prothrombin activity. Two other cases had attacks of angina pectoris probably precipitated by small pulmonary emboli, and here there was indication of increased prothrombin activity at the time of the attacks. In five patients who had mural thrombosis of the cardiac chambers with embolism, no specific change in prothrombin activity was noted.

Eight cardiac patients developed thrombophlebitis or thrombo-embolism. In four of these there was no alteration in prothrombin time; in one case there was an abnormal acceleration of the diluted plasma prothrombin time, and the remaining four showed a slight relative shortening of the diluted plasma prothrombin time when compared with the patients' usual level, though the times remained within normal range. This is in contrast with the findings observed in postoperative and postpartum patients with thrombo-embolism, in which most of the patients presented an abnormally accelerated diluted plasma-prothrombin time.

There is little known of the relation of the prothrombin activity of the blood to the occurrence of intravascular thrombosis. There is no evidence that an increase in prothrombin activity leads to thrombosis, though a marked decrease in prothrombin, such as that produced by dicoumarol, can completely prevent thrombosis. The abnormal acceleration of the diluted plasma prothrombin time which has been observed in cases of thrombo-embolism may be entirely secondary to the thrombosis. There is some indication that the accelerated time which has been interpreted as evidence of increased prothrombin concentration or activity, may be related to other factors, such as changes in the protein fractions of the blood.

Cardiac patients appear more sensitive to dicoumarol than others. Cardiac patients with thrombo-embolism who were given an "averaged" dose of 500 mgm. of dicoumarol over a period of two or more days developed excessive and dangerous elevations of prothrombin time. The administration of dicoumarol to cardiac patients or any patients in a debilitated state must be done with caution.

The therapeutic indications for dicoumarol have not been established. Thrombo-embolism in cardiac patients is such an important cause of morbidity and mortality that every measure of control should be used. Dicoumarol appears to be indicated in the following groups of cardiac patients: those presenting evidence of phlebothrombosis, thrombophlebitis or venous thrombo-embolism; those confined to bed in whom successive prothrombin times reveal an acceleration of the diluted plasma time, even if no definite signs of thrombosis are present. The results are questionable in patients with auricular thrombosis and multiple embolism. Dicoumarol is probably of no value in preventing or minimizing coronary thrombosis, but it is suggested that it be used during the first three weeks following severe myocardial infarction, in an effort to prevent mural thrombosis and venous thrombosis. Dicoumarol should never be used unless there are facilities for accurate daily estimation of prothrombin time. S. R. TOWNSEND.

Surgery

Diverticula of the Stomach. Moses, W. R.: *Arch. Surg.*, **52:** 59, 1946.

Diverticulum of the stomach is rather a rare lesion as only 150 case reports have been recorded in the literature. Eusterman and Balfour located 43% of these anomalies in the fundus, 43% in the prepyloric area, and 14% in the mid-portion of the stomach. Balfour stated in 1942, several years after the former report was made, that the majority are found near the pylorus. The age of onset is usually from 30 to 50 years.

Schmidt and Walters have classified these growths as: (1) True (congenital) diverticula, in which all layers of the stomach are intact; they are due to malformation or interrupted development during the fetal period. (2) False (acquired) diverticula of two types: (*a*) Pulsion type, *i.e.*, those secondary to labour, pyloric obstruction, vomiting, coughing, constipation, or foreign bodies, due to intra abdomen pressure. Eroding lesions such as gastric ulcers or carcinomas may act as causative factors. (*b*) Traction type, *e.g.*, those resulting from perigastric adhesions due to inflammatory lesions of the spleen, gallbladder and pancreas.

As is to be expected roentgenological and gastroscopic examinations should determine the nature of the lesion. Surgical treatment is required. The author records a history of a female patient, 33 years of age, with pains in the lower abdomen for six weeks and vomiting for one week. Ectopic pregnancy was thought to be the cause. At operation 1,500 c.c. of blood was removed but no evidence of this lesion. Several weeks later a second operation was performed when a large gastric diverticulum was removed. The originating source was just posterior to the lesser curvature. G. E. LEARMONTH.

The Surgery of the Thymus Gland. Keynes, G.: *Brit. J. Surg.*, **33:** 13, 1946.

This Hunterian Lecture describes the author's experience with 51 thymectomies in myasthenia gravis. Nothing is known of the function or secretion of the thymus gland. Before the ready regression by x-ray irradiation was demonstrated, partial resection of the gland was sometimes practised for "thymic asthma" in young children. Blalock was the first to undertake total thymectomy for myasthenia gravis, though the association of tumours of the thymus with that disease had been noted for a long time.

In the 51 cases, only 6 thymomas were found, and one of these was infiltrating adjacent structures. Another patient, too ill for operation, was also found to have a malignant tumour at autopsy. Such tumours may rarely be demonstrated by chest x-ray as a shadow against the aortic arch background. Only 2 of the 6 patients with thymomas survived long; the prognosis in such cases is poor.

The difficulties of the diagnosis of myasthenia gravis, the anæsthesia and the postoperative care are discussed. Of the 51, 13 died after operation, some through a relapse of the disease after early postoperative improvement. The prospects of success are greatly diminished in patients over forty. The results in the 33 survivors who have been operated upon long enough for evaluation, show 9 well and normal, 11 greatly improved but requiring some prostigmine, 8 improved, and 5 no better. A history of less than two years, the absence of a tumour, and youth, are the factors that lead to the best response to thymectomy. BURNS PLEWES.

Constrictive Pericarditis. Sellors, T. H.: *Brit. J. Surg.*, **33:** 215, 1946.

Severe myocardial damage rarely occurs when the pericarditis takes the form of a strong fibrous cuirass round the heart. In such cases the heart is strangled by cicatrization of its own investment. Limitation of diastolic supply and reduction of systolic output results in low systolic blood and pulse pressure. Tachycardia and dyspnœa on exertion are early signs. Blood velocity is reduced and blood volume increased. Venous pressure is increased, causing venous pulsation, dependent œdema, cyanosis, liver enlargement, and ascites. The lungs are unaffected. The heart is quiet and relatively immobile.

Constrictive pericarditis may be tuberculous, old pyogenic, or idiopathic. In the author's experience, most are of tuberculous origin. Long periods of observation and rest are advocated, especially that active disease be given adequate chance to heal.

After discussing the dangers of dissecting over thin-walled auricles and great veins, and the wisdom of opening the pleura, a limited freeing of the ventricles by operation is advised, though the greater the area of myocardium bared, the better the results. The left ventricle should be dissected first. Both the visceral and parietal pericardium are removed in one layer. Extrapleural and transpleural approaches to the pericardium are described. The control of hæmorrhage, cardiac dilatation, undue turbulence, fibrillation, and collapse of the lung are discussed.

Clinical improvement after operation is often rapid, but recovery from venous congestion, ascites and liver enlargement may take many months. Liver function may have been permanently damaged. BURNS PLEWES.

The German Hospital Centre at Abano Terme. Mitchell-Heggs, F. and Walter, W. J.: *Brit. J. Surg.*, **33:** 235, 1946.

This article describes a 2,500-bed hospital centre in a spa town of North Italy used by the Germans for the eight months preceding the cessation of hostilities. In nearly every aspect, enemy care of the wounded proved to be old-fashioned and inferior by British standards. The crowding of wards with furniture and men's gear, poor hygiene and careless aseptic technique (masks and gowns were not worn), explained the foul odour of the wards and the emaciated, feverish patients. There was a shortage of soap, clean linen, and inadequate nursing staff, so that patients were unwashed and long-haired, flies abounded, pus was seen everywhere.

Flesh wounds were inadequately excised and most were infected. Secondary suture and grafting was not done. Amputations were all of the guillotine type and deep infection was frequent. Limb plasters were generally inefficient, failed to allow finger and toe movement, and were too long below the knee, too short above. Nearly every penetrating chest wound resulted in empyema. Blood transfusion was carried out by the direct method (arm to arm) in 250 c.c. doses.

Nevertheless, the orthodox German policy, as printed in directives, was generally sound. That conditions and treatment in captured German hospitals were so poor was partly due to disrupted communications, but mostly to inexperienced and poorly trained medical officers. German medical services failed in adaptability and good judgment. BURNS PLEWES.

The Repair of Cranial Defects with Special Reference to the use of Cancellous Bone. Carmody, J. T. B.: *New England J. Med.*, **234:** 393, 1946.

The most satisfactory metal used in the repair of cranial defects is tantalum which offers inertness, mobility and strength. However, the possibility of cortical fixation has not been completely disproved, its presence precludes any further x-ray studies and, in the event of the area breaking down, the basic inertness of the metal does not prevent its extrusion like any other foreign body.

Small and medium sized cranial defects are best repaired by the use of autogenous cancellous bone taken from the crest of the ilium. The technique of the author is explained in detail and reports and illustrations of cases presented. NORMAN S. SKINNER.

Survey of Abdominal Wounds in 21 Army Group. Porritt, A. E.: *Brit. J. Surg.*, **33:** 267, 1946.

The consulting surgeon to 21 Army Group reports on 5,105 cases treated between June 6, 1944 and May 8, 1945 in North West Europe. The over-all mortality was 29%, ranging from 10% where there was no discoverable visceral injury, to 42% where the wounds involved the chest as well as the abdomen.

The viscus most frequently wounded was small bowel, next was colon, liver, then rectum. Least frequently were spleen and pancreas. The gastro-intestinal tract accounted for 70% of the lesions. Resections of small bowel was followed by twice the mortality of suture. The mortality rate when other wounds beside the abdominal were present rose to 46%. Wounds of the solid viscera (including bladder) were less lethal than those of the alimentary tract. Wounds of the colon showed a lower mortality than wounds of the stomach and small intestine. Officers, men, and prisoners showed similar mortality rates, but civilians (probably because of poor nutrition and inclusion of the very young and very old) showed a much higher rate: 49%.

Two-thirds of the deaths occurred within 48 hours of laparotomy; 40% of the deaths were labelled "shock" and never picked up after operation; 11% died from peritonitis, 1.6% from pulmonary embolism, 5% from associated injuries, 3.3% from renal failure, 3.3% intestinal obstruction, 2% extraperitoneal sepsis, 1.2% respiratory obstruction. Penicillin was almost universally used in abdominal cases in 21 Army Group.

Of thoraco-abdominal wounds, 39% were explored through the thorax with a mortality of 26%, while 61% were treated through an abdominal approach with a mortality of 40%. Splenectomy via a thoracic approach is reported as an easy procedure.

The buttock is second only to the anterior abdominal wall as the commonest site of entry. Jaundice and anuria were among the commonest postoperative complications. The average wound-to-operation interval was 12 hours; in deaths from peritonitis it was 21 hours. BURNS PLEWES.

Obstetrics and Gynæcology

The Psychosomatic Treatment of Hyperemesis Gravidarum by Hypnosis. Kroger, W. S. and De Lee, S. T.: *Am. J. Obst. & Gyn.*, **51:** 544, 1946.

Nineteen cases of nausea and vomiting of pregnancy of varying intensity, ranging from the exaggeration of physiological vomiting to true hyperemesis gravidarum, who obtained little or no relief following a wide variety of symptomatic treatments, were completely relieved of their subjective symptoms following the use of hypnosis, either with direct suggestion or with hypno-analysis and age regression. All patients except two were completely relieved utilizing these methods.

This form of therapy may act either by raising the vomiting threshold directly or by preventing contractions from the gastro-intestinal tract reaching the higher sensorium. Again the method of eliciting latent psychogenic factors responsible for the nausea and vomiting and integrating them into consciousness is also a convenient, time-saving and most effective therapeutic procedure for permanently relieving this ordinarily refractory condition.

The authors believe that this valuable adjunct in the treatment of the nausea and vomiting of pregnancy should be utilized by obstetricians. ROSS MITCHELL.

A Case of Clostridium Welchii Puerperal Infection Treated with Penicillin. Goldberg, R. B. and Konigsberg, W. K.: *Am. J. Obst. & Gyn.*, **51:** 527, 1946.

A case of moderately severe postabortal puerperal infection with *Cl. Welchii* was successfully treated with penicillin given intramuscularly in a total dosage of 1,200,000 units. The patient's condition improved within six hours after commencing therapy. The possibility that combined penicillin and specific antitoxin therapy may be more rational and potentially more effective is suggested. ROSS MITCHELL.

Occurrence of Ovulation and Causes of Sterility in Metropathia Hæmorrhagica. Gartside, I. B.: *Brit. M. J.*, **1:** 604, 1946.

A case is described of metropathia hæmorrhagica in which the presence of chorionic villi shows that ovulation had occurred. Histological studies show that in addition to infrequency or total absence of ovulation, nidation may be incomplete, and the inability of the fertilized ovum to embed itself may be due to the partially or completely unprepared state of the endometrium. In this case stromal change was fairly well developed while glandular response was scarcely apparent. ROSS MITCHELL.

Pædiatrics

Mumps. Use of Convalescent Serum in the Treatment and Prophylaxis of Orchitis. Rambar, A. C.: *Am. J. Dis. Child.*, **71:** 1, 1946.

This is a careful clinical study of 249 hospitalized cases of mumps in naval men. They were mostly under 21, but the ages varied from 17 to 39 years. Eighty-six of the patients were given 40 c.c. convalescent serum intravenously on admission; the other 163 served as controls.

There was a significant reduction in the incidence of orchitis in the serum treated group, 16.27% as against 28.83% in the controls. The average time of onset of the complication was 6 days after that of the mumps.

Encephalitis occurred in 40 cases, with no difference between the two groups, except a somewhat later onset in those receiving serum, an average of 5.8 days against 4.8. Diagnosis was based on clinical symptoms, pleocytosis in the spinal fluid, and absence of other complicating factors. Fifteen individuals had both orchitis and encephalitis. Asymptomatic cases did not have spinal fluid examinations, hence the number with latent encephalitis is unknown. Conjunctivitis was found in 13 cases and presternal œdema in 4, usually coming on about the 6th day. The latter condition is attributable to lymphatic obstruction caused by pressure of swollen salivary glands. Pancreatitis was not definitely diagnosed in any one of the 249 cases.

The glands involved were the parotid bilaterally in 112, unilaterally in 75: the parotid and submaxillary or sublingual, in 54: the submaxillary alone, in 8.

The treatment of orchitis with convalescent pooled serum or plasma did not give spectacular results. In 26 cases, 16 showed a drop to normal temperature in 3 days or less: in 30 controls, only 10 had this early drop. The average duration of fever in the treated group was 4.52 days, in the controls 5.4. "The value of serum or plasma as a therapeutic procedure cannot be definitely demonstrated."

A great number of previous reports are cited, bearing on the use of convalescent serum for prophylaxis in exposed contacts, and in patients with mumps as a protective agent against other systemic manifestations of the disease. Hepatitis occurred in some cases. The author holds that "convalescent serum appears to be the best available means of preventing mumps and of decreasing the incidence of orchitis.

R. CAMERON STEWART.

Hygiene and Public Health

Penicillin Lozenges in Treatment of Oral Infections. Levitt, Captain R. O. and Leathen, Captain W. W.: *Occup. Med.*, **1**: 81, 1946.

Acute infections of the nasopharynx and tonsils have been the cause of large numbers of noneffective service men in the armed forces of the United States. The use of specific chemotherapy proved to be very disappointing. When administered parenterally, orally or in lozenge form, the sulfonamide compounds have not produced satisfactory results. Penicillin administered parenterally has also failed to influence the course of the infection.

In this article the authors describe the use of penicillin locally in a form that can maintain a high concentration of the drug in the mouth for a relatively long time. The lozenge used was made of acacia and penicillin in the required dosage, and included powdered sugar and peppermint as flavouring agents. The method of employment is described and details given of the clinical results when treatment was given to a number of patients, members of the armed forces of the United States. As the results from the use of lozenges of 100 unit strength were not much better than those obtained by nonspecific measures, the strength of each lozenge was increased to 500 units. Of 117 patients treated for acute inflammation of nasopharynx or tonsils, 110 showed rapid improvement, 99 being cured within 24 hours. Of the 7 patients who did not respond to the treatment, 5 had tonsillitis complicated by cervical adenitis, when first seen. Penicillin locally appears to have no effect on these deep tonsillar infections. Six subjects with Vincent's infection of the mouth were treated. Each used 6 lozenges daily for several days, resulting in complete healing within 72 hours.

It was observed also that the average length of hospitalization for patients treated with penicillin was less than that for those receiving nonspecific treatment.

From a military and economic standpoint the results of this form of therapy are very important in that 74% of these patients were treated on an outpatient status and there was no loss of time or efficiency.

MARGARET H. WILTON.

OBITUARIES

Dr. Duncan A. Campbell died April 28 in Orlando, Florida. He had been ill since last October when he underwent a major operation in Toronto. He was born in Hepworth, Ontario, in 1888. In 1909, Dr. Campbell graduated in medicine from the University of Toronto. He was general practitioner in North Bay since before the First Great War and was regarded as one of Northern Ontario's finest surgeons.

Dr. Campbell was a supporter of the Presbyterian church, in whose activities he played an important rôle.

An enthusiastic sportsman, he was best known for his interest in golf. He was president of the North Bay Golf and Country Club, and pioneered a part in its initial organization. He was fond of hunting, and was a keen shot. An albino deer once shot by him is now mounted in the Ontario museum.

He was a staunch Conservative by politics, and was one of the former presidents of the North Bay Conservative Association.

He is survived by his widow and one daughter.

Dr. John Ewart Campbell, aged 68, of Secret Cove, B.C., died in Vancouver General Hospital recently.

Dr. Campbell graduated in medicine from McGill University in 1902 and came to British Columbia in 1908, first practising in Nelson, then in North Vancouver. After studying in Paris and Berlin, he practised in Vancouver.

In World War I, he joined the Canadian Army Medical Corps in 1914 and served overseas with No. 5 Canadian General Hospital at Salonika. On his return to Vancouver in 1919 Dr. Campbell practised here and was on the medical staff at Shaughnessy Hospital from 1920 to 1944, when he retired.

He is survived by his widow.

Dr. Andrew Carmichael, aged 81, died on May 19 in Bawlf, Alberta.

Native of Spencerville, Ont., Dr. Carmichael was a graduate of Queen's University, Toronto. He practised in Ontario for 18 years prior to coming to Edmonton in 1908, where he worked on the South Side of the city. He moved to Bawlf nine years later and was active until his death.

Dr. Carmichael was a district deputy grand master of the Masonic Order in Ontario and was associated with the Acadia lodge in Edmonton. He was an affiliate of the United Church.

Surviving are one son and five daughters.

Dr. Carmichael and his wife celebrated their golden wedding anniversary three years ago.

Dr Georges Cloutier est décédé à St. Georges de Beauce le 11 mai, après une longue maladie. Il était âgé de 78 ans et demi. Dr. Cloutier était reçu médecin en 1896. Il laisse son épouse et deux fils.

Dr. George Ockley Hutchinson died at the Prince of Wales Naval Hospital at Plymouth, England, recently. He was medical officer on the Cable Ship, *Lord Kelvin* and was taken ill while the ship was in the Bay of Biscay. He was born in Toronto and graduated from Trinity College in 1899. For three years after graduation he practised in Toronto. Coming to Nova Scotia, he practised in Gabarouse, Cape Breton, until he came to Halifax about eighteen years ago. During the first Great War he was a captain in the Canadian Army Medical Corps. A brother, Dr. Harry Hutchinson, resides in Winnipeg.

Dr. Arthur Morrell Johnson died recently at Bury, England at the age of 59 years. He was born at Tatamagouche, Nova Scotia, a son of Dr. Daniel McIntosh Johnson, and graduated from Dalhousie Medical School in 1911. He was one of nine immediate relatives who entered the medical profession. He had a distinguished military record in the first World War, being awarded the Military Cross. Afterwards he became associated with his uncle in Bury and they practised together until 1929. He had a notable career in surgery, being on the staff of the Bury Infirmary for many years. He was made a Commander of the British Empire in 1939. In 1940 he was again on active service and took part in the retreat from Dunkirk. Later he was in charge of the 6th General Hospital in Egypt. He returned to civilian life in 1942.

Dr. George F. Laughlen, died on May 12 at his home in Toronto after a week's illness. He had been pathologist at the Toronto East General Hospital since its opening in 1930 and for the last 20 years had held a similar position at St. Joseph's Hospital.

Dr. Laughlen attended Albert College. He interrupted his university course to enlist for service in Egypt in the first Great War. Returning to Canada, he completed his medical studies and took postgraduate work under Prof. J. J. MacKenzie.

Dr. Laughlen was known for the rapid test for syphilis which bears his name. Chairman of the section of pathology of the Academy of Medicine, he served for some years on the council. He was a past president and active member of the Toronto East Medical Association. A keen sportman, he was active in golf, lawn bowling and tennis and was a member of the Rosedale Golf Club. He was a member of the United Church.

Dr. Laughlen was married in 1920 to Dr. Vivien Marvin, who since that time has worked with him in medical practice.

Dr. W. G. McCulloch died on May 21 in the Oshawa General Hospital. Before his retirement eight years ago, he was a medical practitioner in Darlington Township.

A native of Darlington Township, he graduated in medicine from University of Toronto in 1908, and until the time of his retirement, practised at Orono. He was a member of Park Street United Church, the IOOF, and the Orono Masonic Lodge.

He is survived by his widow, two sisters and two brothers.

Dr. J. A. McInnis, of Timmins, one of Northern Ontario's best known medical practitioners, died May 11 in a Toronto hospital. He was 65.

Born and educated in Lindsay, Dr. McInnis was a graduate of the University of Toronto. Going to Northern Ontario in 1909 he was in the Porcupine camp prior to the great fire of 1911. He and several other young doctors worked night and day during that historic fire to give aid to the injured and burned.

He moved to Timmins in 1914 and helped organize the Board of Trade, while serving on the Timmins Council for 11 years, seven as mayor.

He was president of the Porcupine branch of the Navy League, an active member of the Porcupine Rod and Gun Club and a member of First United Church.

He helped in the organization of the first fire department and the first hospital facilities in the Porcupine district. He later was medical health officer for Timmins.

Dr. Charles A. MacQueen, of Amherst, N.S., died on May 21 at the age of 87 years.

Dr. MacQueen was a member of the well known family of that name of Shediac which gave so many men of distinction to the political and professional life of the neighbouring province and he himself was not the least in ability and professional attainment.

In his early life he decided on the medical profession as his vocation and he was a graduate of the Jefferson Medical College in Philadelphia.

His first practice was in River Hebert some 60 years ago but a short time later he came to Amherst and was a constant practitioner here until about five years ago.

He travelled extensively and was held in high regard by his colleagues and had their confidence to an unusual degree.

He was generous to every cause that appealed to him and was a steady benefactor of Highland View Hospital. He was one of the three donors to contribute $10,000 each to the rebuilding of that institution in 1928.

He was unmarried.

Dr. Murdock Daniel Morrison, recent graduate from Bellevue Hospital Medical College, New York, became licensed to practise in Nova Scotia on April 24, 1895. May 14, 1946, a few days past his fifty-first anniversary, his long life ended in tragedy. Struck by an automobile near his home, he died a few minutes later.

He was born at Englishtown, Cape Breton, the eldest son of Mr. and Mrs. Neil Morrison. After graduating from Sydney Academy and before beginning the study of medicine, he taught school, and his traits as a teacher he bore through his whole professional career. His first practice was at Reserve Mines where he practised with Doctor William MacKay, Senator. A few years later he moved to Dominion, and there remained until coming to Halifax in 1917.

Early in 1917 the Workmen's Compensation Board came into being. For a time it functioned without a medical officer, but such an official became a necessity and Dr. Morrison came to Halifax to fill the position. In this new field of medical endeavour he was one of the pioneers. From his years of practice among them, he was able to deal with sympathy and understanding with accident cases in the mining districts. Functional disabilities claimed his particular interest and after much research and observation he presented his conclusions in an excellent paper before the Halifax Medical Society. That was one of his characteristics: careful study and preparation for any endeavour. The result was something to be relied on—a classic of its kind. In 1934 the late Dr. O. G. Donovan was appointed as his assistant, and they worked together until 1937, when after twenty years of service Dr. Morrison retired.

Besides his professional interests, he had many of a social and intellectual nature. St. Anne's, near his birthplace, was the temporary abiding place of Reverend Norman MacLeod and his pioneer settlers. This most interesting chapter in the history of our Province was first revived and written by Doctor Morrison. He was proud of his Highland Scottish Ancestors, and delighted in the work of the Gaelic College at St. Anne's, and the annual Mod. He was chief of Clan Morrison. The North British Society and Nova Scotia Historical Society, of which he was long a member, were strengthened by his interest and support.

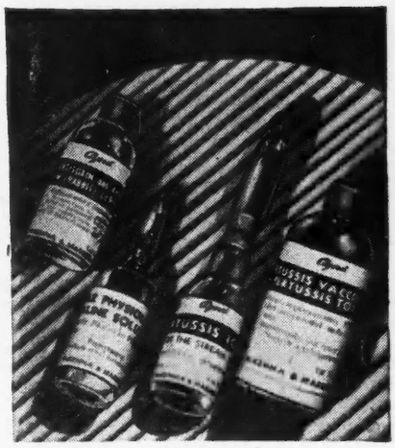
He is survived by three daughters, one son, two brothers and one sister. H. L. SCAMMELL

Dr. Robert Samuel Richardson, aged 59, prominent as a skin specialist, died May 9 at his home at Pefferlaw, Ontario. He had been ill for three years. Dr. Richardson was born in Toronto. He attended Upper Canada College and graduated in medicine from the University of Toronto in 1908. After postgraduate work in surgery in England, he returned to Toronto and later spent some time in England in the study of skin diseases. For many years he served as specialist on the staff of the Toronto General Hospital. He was an Anglican and a member of the Masonic order and the Shrine.

Surviving are his widow, two sons and a sister.

Dr. Herbert B. Rogers died on May 2 in Royal Jubilee Hospital, Victoria.

He came to British Columbia in 1886 as mail clerk on the first C.P.R. train to Vancouver, and had resided in the province since that date. After completing a



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medical course at McGill University he was appointed superintendent of the Chemainus General Hospital, a position he held for more than 30 years, his tenure being interrupted only by service in the Canadian Army Medical Corps between 1914 and 1918.

Dr. Rogers was later appointed medical superintendent at Royal Jubilee Hospital, and retired from practice about 10 years ago.

He is survived by his widow and one son.

Dr. Herbert Ross, of Montreal, died on May 12, in his 70th year.

Dr. Ross attended Montreal High School, and later McGill University, where he graduated in arts and medicine. He interned at the Montreal General, and did postgraduate work in Edinburgh, Paris and London.

He is survived by his widow, three sons and two daughters.

Dr Jean-Auguste Ross est mort le 28 avril, à Mont-Joli, Québec. Né à Bic en 1880, le Dr. Ross fit ses études commerciales à Memrancook, N.B. et ses études classiques au collège de Rimouski et au séminaire de Québec. Il fut admis à la pratique de la médecine à l'université Laval de Québec en 1906. Il laisse dans le deuil, son épouse et deux sœurs.

Col. Adam Tozeland Shillington, M.D., C.M., died in Ottawa May 22, in his 76th year.

Born at Prospect, Lanark County, in August, 1870, he was a son of Samuel Kerfoot Shillington and Ann Eliza Shillington, whose ancestors settled in Goulbourn after coming to Canada in the early part of the 19th century from Ireland.

After concluding his public and high school education at Kemptville, he entered McGill college and graduated from there in 1894. Subsequently he went to London, England, where he completed a postgraduate course.

Enlisting in the Canadian militia in 1896, he became medical officer of an Ottawa unit two years later. During the first World War of 1914-1918, he crossed to Britain with the First Division and served in France and England until after the signing of the Armistice on November 11th, 1918.

Col. Shillington was chairman of the committee of legislation when the Canadian Medical Association was established, and he became the first vice-president of the Ontario Medical Association in 1913.

Also associated with other medical organizations, he was president of the Association of Officers of the Medical Services of Canada in 1913, the Ottawa Medical Society in 1903 and the Ottawa Medico-Chirurgical Society in 1918.

He was also associated with the National Geographical Society in addition to several other medical organizations.

Enlisting with the active army again in September, 1939, he served as president of the Standing Medical Board in the Ottawa Area Command until being appointed Senior Medical Officer, Ottawa Area Command. He retired from the army in January, 1944, having reached the age limit of his rank, and again resumed his practice of medicine and surgery here in Ottawa.

During his outstanding military career both in the Dominion and on the Continent, the late Col. Shillington was frequently mentioned in despatches for his fine services to the army.

A Methodist, the late Col. Shillington belonged to the Rideau Golf Club, the Royal Ottawa Golf Club, the Ottawa Hunt and Golf Club, the Junior Army and Navy of London, the Wawa Keshi Fish and Game Club and was also a member of the AF and AM and the Independent Order of Oddfellows.

Surviving are two sons, and a daughter, Mrs. K. F. Wrangell, of 172 Bayswater Avenue.

Dr. Louis Slotin, aged 35, died in Santa Fe, N.M., May 30 as a result of exposure to atomic radiation.

In a letter to Dr. Slotin, Maj.-Gen. L. R. Groves of the U.S. army, in charge of atomic research at Los Alamos, N.M., where the accident occurred, said he had "admiration and appreciation to you for your heroic act when the mishap occurred. With disregard of personal danger to yourself, you undoubtedly prevented a much more serious accident."

Dr. Slotin was fatally injured when he threw himself between the explosion and others in the laboratory.

He is survived by his parents, Mr. and Mrs. A. I. Slotin of Winnipeg.

Dr. John J. Smith, aged 76, died on May 19 in Halifax.

Dr. Smith was born at Merigomish, Pictou County, and spent many of his active years in medicine in Newfoundland. He served at Tilt's Cove, and then moved to Botwood in 1898. Later he served at Bishop's Falls.

Retiring in 1930, he moved to Windsor where he lived until 1941, when he moved to Halifax.

He is survived by his widow, one daughter, one sister, and several brothers.

NEWS ITEMS

British Columbia

Surgeon Captain David W. Johnstone, O.B.E., R.C.N.V.R., recently discharged after six years' war service has been appointed Medical Adviser to the Department of Veterans' Affairs for British Columbia. Prior to the war Dr. Johnstone was in practice in Regina.

The Provincial Government has recently announced that a survey of the hospital situation in the Province will be conducted at an early date. The services of Mr. Graham L. Davis, Hospital Director for the W. K. Kellogg Foundation, have been secured for this survey. Interested groups such as the British Columbia Medical Association, the B.C. Hospitals Association, Registered Nurses' Association have been invited to lay their views and suggestions before Mr. Davis. The British Columbia Medical Association has also been asked to nominate a representative to sit in conference with Mr. Davis during his hearings.

This survey is indeed a timely one, and it is hoped that it will result in some alleviation of the present acute shortage of hospital accommodation, and also that it will produce an effective long-term policy to meet hospital requirements throughout the Province in the future.

At the Annual Meeting of the Vancouver Medical Association held recently the following were elected to office: *President*—Dr. H. A. DesBrisay; *Vice-president*—Dr. G. A. Davidson; *Honorary Treasurer*—Dr. Gordon Burke; *Honorary Secretary*—Dr. G. C. Johnston.

The following Medical Officers have recently returned to the Province and have received their discharge: Squadron Leader L. S. Chipperfield, New Westminster, Major G. H. Francis, Vancouver, Major W. R. Walker, Penticton, Captain J. H. Black, Vancouver and Captain F. L. Wilson, Trail.

A recent outbreak of smallpox in Seattle caused a remarkable voluntary rush for vaccination in British Columbia. Public Health authorities estimate that over 350,000 persons in the Province were vaccinated, even though no cases of the disease occurred in the Province. The voluntary demand for vaccination has proved most gratifying to the Public Health authorities.

There is continual progress being made in the Province with regard to the pasteurization of milk. In 1940

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gr. ¼	" " "	gr. 1
gr. ½	" " "	gr. 2
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LONDON AND MONTREAL

there were only 13 areas in the Province where pasteurized milk was available. At this date there are 36 centres in the Province where this protection is available, with 4 more planned. Vancouver is now considering a by-law to provide for universal pasteurization of all milk supplied in the city.

We record with a considerable feeling of disappointment that the Board of Governors of the University of British Columbia after full consideration have decided that the proposed Medical School of the University cannot be started this year. The medical profession in the Province has repeatedly urged the necessity of the early establishment of a Faculty of Medicine at the University of B.C. It is realized that existing difficulties in the establishment of the Medical School are tremendous, but it is hoped that the delay will be of short duration.

As this is written final preparations are being made for the Annual Meeting of the College of Physicians and Surgeons of British Columbia and of the British Columbia Medical Association which will be held during the Canadian Medical Association Meeting at Banff. All indications point to an outstanding meeting.

Manitoba

Dr. William G. Lyall, clinic medical officer of the Canadian National Railways in Winnipeg, was honoured on June 7 when he retired under the company's pension rules. Officers and staff of the railway, headed by W. R. Devenish, vice-president, paid tribute to Dr. Lyall for the great atmosphere of friendship and high regard which had developed over the long period of his service. Mr. Devenish presented him with a wallet on behalf of the officers of the company, and Dr. Emmet Dwyer, regional medical officer, made a presentation on behalf of the medical staff. Dr. Lyall's railroad career extended over 48 years. He has served the Canadian National Railway as physician, eye and ear examiner and clinic medical officer.

Radio station CKSB, the French language radio of St. Boniface was formally opened on May 27. The president of the company is Dr. Henri Guyot of St. Boniface.

The return of medical men from the services to civilian life has resulted in many changes in the attending staffs of hospitals. At the annual meeting of the Winnipeg General Hospital it was announced that Col. P. G. Bell, D.S.O., and Lieut.-Col. A. M. Davidson had resigned. Dr. W. E. Campbell had been appointed head of the department of ophthalmology succeeding Col. Bell. The following have resumed duty after demobilization: Drs. J. D. Adamson, head of the department of medicine; L. G. Bell, G. L. Adamson, F. A. L. Mathewson, H. Medovy, G. S. Fahrni, J. S. Hillsman, C. W. Clark, M. B. Perrin, A. A. Klass, D. Swartz, G. H. Ryan, R. Lyons; J. W. R. Rennie has been appointed temporary assistant surgeon. The following have been appointed clinical assistants in the Outpatient's Department: Harriet Perry, N. I. Corne, Gordon Coghlin, L. R. Mackey, Walter Alexander, C. K. Bleeks.

Dr. H. V. Waldon, superintendent of Vita Memorial Hospital has been granted six months' leave of absence. Dr. D. B. Stewart and Dr. W. Guest are now serving in the hospital.

ROSS MITCHELL

New Brunswick

The Governor-General at a recent investiture at Toronto decorated Lieut.-Col. Jos. Tanzman with the O.B.E. decoration, won on service in Europe.

Dr. A. T. Leatherbarrow of Hampton and Dr. H. A. Farris of Saint John attended the meeting of the American College of Physicians, at Philadelphia.

Dr. Norbert Grant has been demobilized from the R.C.A.M.C. and has begun practice in Saint John in association with his brother Dr. Earl T. Grant.

The Saint John Medical Society at its May meeting enjoyed the privilege of listening to three speakers report on new advances in medicine as observed by them on recent visits to the U.S.A. Dr. D. J. Tonning discussed endocrine studies and methods of treatment. Dr. Jos. Tanzman reported changes and advances in Gynæcology and Dr. Norman Skinner reviewed treatment in Cardiac diseases and hypertension.

Dr. J. M. Barry, Registrar of the Medical Council of N.B. reports that the following new doctors are practising in the following locations. Dr. Robt. Chalmers, Fredericton; Dr. Raymond Bourgeois, Tracadie; Dr. S. A. Hopper, Moncton; Dr. T. Alton Ross, Salisbury; Dr. Geo. D. Gass, Sackville; Dr. Robert F. Ingram, Campbellton; Dr. R. B. Eaton, Sackville and Amherst; Dr. Fred George, Saint John; Dr. Geo. W. McElman, Sussex; Dr. Chas. F. Sears, St. Stephen; Dr. D. E. Morehouse, Upper Keswick; Dr. A. A. Rowan, Fredericton; Dr. David W. Allen, St. George.

The Tuberculosis Hospital at St. Basil and the New Hotel Dieu Hospital at Edmundston are nearing completion and will greatly relieve conditions in the department of Madawaska.

A. S. KIRKLAND

Nova Scotia

Dr. J. A. Noble of Halifax has been appointed Director of Surgery at Camp Hill Hospital operated under the Department of Veterans' Affairs. Prior to the war Dr. Noble was assistant surgeon on the staff of the Victoria General Hospital. He had a distinguished overseas record and was awarded the O.B.E.

A recent visitor to Halifax was Major I. R. Gold of the United States Medical Corps. Dr. Gold is a Canadian, born in Glace Bay, and graduated from Dalhousie University and was doing postgraduate work in New York when he joined the American Army in 1940. He had a wide and varied experience in the Far East Campaign and assisted in the care of Premier Tojo after his self-inflicted wound. Major Gold, whose mother now resides in Montreal, will return to New York.

Dr. H. K. MacDonald of Halifax left on June 1 for Banff, where he will attend the meetings of the Association, which will honour him as a practitioner of fifty years' standing.

Dr. F. B. Day of Thorburn, who has practised for many years in that mining community, will shortly retire from active practice.

Dr. J. S. Brean has again been re-elected mayor of Mulgrave. Altogether he has served in this capacity a period of fourteen years.

On June 15 your correspondent will sever his connections as Medical Officer with the Workmen's Compensation Board, which he has held since 1937, and will assume an executive position on the staff of Dalhousie University.

H. L. SCAMMELL

Ontario

The largest class reunion at the annual dinner of the Ontario Medical Association was that of 1925 University of Toronto. Twenty-five classmates dined together including Dr. Hume of Michigan, Dr. Wm. Miller of New York and Dr. Coutts of Cape Vincent, New York. At graduation Dr. E. C. Fielden was the big man of the class but, though he has taken on thirty or forty pounds of weight since then, he was eclipsed in size by Drs. Coutts, Hume, Plewes and W. H. Russell. No one had a DuBois table with him so scientific interest in the phenomenon cannot be furnished.

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The Annual Meeting of the Ontario Medical Association was held in the Royal York Hotel, Toronto, May 20 to 24. The attendance was large and it is noticed that the attendance of young doctors seemed larger than usual. This was a most hopeful sign of progress. The Valedictory address of the President, Dr. C. J. Devins, ended a strenuous year of work well done. His successor Dr. William Magner was installed in office. Dr. C. A. White of Chatham was made President-elect and Dr. Carson of Brantford elected Chairman of Council.

The Medical Alumni of the University of Toronto reached a new high in successful endeavour under the presidency of Dr. George Anglin during the past year. At the Annual Meeting in May, Dr. E. J. Clifford of Toronto was elected President and Dr. J. L. King of Galt, President-elect. A strong and representative committee ensures another year of good work.

The class of '21 had a reunion dinner but they made it a private affair. There was a large attendance but that is all the information given for publication.

On May 11, Dr. Alan Brown, Physician in Chief of the Hospital for Sick Children, Toronto, gave a dinner to members of the medical staff and others in recognition of the services rendered the hospital by Dr. Alan Caulfield for forty years, Dr. George Smith for thirty years and Dr. A. P. Hart for twenty-five years. These men are retiring from the active staff and have been appointed consultants to the hospital. Mr. Gerald Larkin on behalf of the trustees of the hospital recognized this almost century of service by presenting to each of the retiring members of staff a silver salver suitably engraved. It is good to note that all three of the men mentioned are still in vigour of mind and body and will continue in private practice. The age of retirement is inexorably fixed and they are obliged to conform to the dictum of the coloured preacher and "co-operate with the inevitable".

Dr. Paul Dudley White of Boston was guest lecturer in the Third Medical Alumni Lectureship of the Faculty of Medicine, University of Western Ontario, May 9, 10 and 11. The Annual Academy Day of the London Academy of Medicine was held coincidentally on the afternoon and evening of May 9. Dinner at the Hunt Club followed Dr. White's address on "The management of heart disease in childhood". Dr. White had discussions in clinical conferences following case presentations by Drs. Duffy and Turnbull on May 10 and by Dr. F. S. Brien on May 11. He also gave two other lectures on "Recent progress in the management of coronary and hypertension heart disease" and "Early symptoms and signs of heart failure and their treatment". Interesting papers were contributed during the session by Drs. H. A. Skinner, G. B. Sexton, E. A. Bartram, H. Little, L. D. Wilson, D. W. Crombie, B. D. McNeel, J. A. Lewis and C. A. Cline.

Dr. Henry S. Doyle of Toronto has been appointed Director of the Division of Communicable Disease in the Department of Public Health of Saskatchewan.

Dr. Septimus Thompson of London retires at the end of the present session as Professor of Ophthalmology and of Otolaryngology in the Faculty of Medicine, University of Western Ontario. He has filled this position with distinction for the past 39 years and will retain his connection with the University as Professor Emeritus.

M. H. V. CAMERON

Prince Edward Island

Dr. Francis A. MacMillan has entered into partnership with his brother, Dr. J. A. MacMillan, Charlottetown, in the practice of medicine and surgery. Dr. Francis MacMillan graduated from McGill in 1942 and served as intern at St. Mary's Hospital, Montreal. He joined the army in 1942, went overseas in February 1944, and crossed the English Channel in July, 1944. He saw service with the Essex Scottish Regt., the 11th Canadian Field Ambulance, and the Royal Regt. of Canada (Toronto). He was appointed Major in 1945 and made Deputy Assistant Director of Medical Service for Army Troop Area in Holland.

Dr. George S. A. Inman who at present is completing a postgraduate course in Surgery at the Montreal General Hospital, is opening an office at Montague in July. For three years prior to taking his postgraduate course Dr. Inman practised in New Brunswick.

Dr. Harold P. Stewart recently demobilized from the Royal Canadian Army Medical Corps has opened an office in Eldon. Dr. Stewart is a graduate of Prince of Wales College and Dalhousie University; formerly he interned at the Prince Edward Island Hospital at Charlottetown.

Dr. T. B. Acker of Halifax was in Charlottetown and Summerside during the latter part of May. Dr. Acker has been for a number of years the specialist in Orthopædics for the Red Cross Crippled Children's Clinics. Needless to say the splendid work carried on by Dr. Acker during these years is most heartily approved and supported by the people of this province.

A. J. MURCHISON

Quebec

Major-Gen. C. P. Fenwick, C.B., C.B.E., M.C., E.D., of Toronto, who was director general of medical services for the Canadian Army in the late war, has been named chief of medical services for the Canadian Pacific Railway with headquarters in Montreal.

He succeeds Dr. H. A. Beatty, L.R.C.P., M.R.C.S., F.R.C.S., F.A.C.S., of Toronto, who has retired after 44 years of service, 30 of them in charge of the medical department. A brother of the late Sir Edward Beatty, long chairman and president of the C.P.R., Dr. Beatty's first position was chief surgeon for the Ontario division in 1902.

General Fenwick, a soldier in both great wars and a militia officer in between, was with the Canadian Army's medical service from its very beginnings in September of 1939, through Dieppe and the Central Mediterranean campaign to the invasion of Europe. Going overseas with the First Division in 1939 his subsequent career saw him in all Canadian theatres of the German War. He came back to Ottawa from Holland the last time in January of 1945. In his rise to director general of the medical service he was successively assistant director and deputy director. The King honoured him twice for his services creating him Commander of the British Empire in 1944 and Commander of the Bath in 1946. His Military Medal he won in the first war with the Canadian Expeditionary Force in 1917, a year after his graduation in medicine from the University of Toronto in 1916.

A native of St. John's, Newfoundland, he is a son of the late Rev. Dr. Mark Fenwick and came to University of Toronto from Methodist College at St. John's.

Le Conseil national des recherches vient d'accorder à la faculté de médecine de l'Université Laval un octroi de $11,200 dont la majeure partie est destinée à l'Institut d'hygiène et de biologie humaine.

Le Bureau Provincial de la Santé, 1470 rue St-Hubert à Montréal, annonce aux médecins de la province qu'il est en mesure de fournir gratuitement du plasma sanguin pour le bénéfice des indigents.

Le Dr Louis Berger, professeur à la Faculté de médecine de Laval a été élu membre de la Société Royale du Canada (section: Sciences biologiques).

Aux récentes élections à l'hôpital Notre-Dame de Montréal, le Dr R. Amyot fut nommé président du Conseil médical et le Dr Paul Bourgeois, président du

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THE PUBLISHERS

Bureau médical. Les Drs Jules Brault et Albert Guilbeault deviennent chefs-adjoints.

On construira dès cet été à Ste-Germaine du Lac Etchemin un grand sanatorium pour hospitaliser les tuberculeux de cette région de la province. Cet hôpital coûtera environ $1,500,000 et pourra recevoir dès le début 500 malades.

Les Sœurs de la Miséricorde feront construire au cours de l'été un hôpital de 150 lits, réservé aux femmes. Cet hôpital sera agrandi plus tard et pourra recevoir des malades des deux sexes.

On vient d'annoncer l'agrandissement de l'Institut Royal Edward, rue St-Urbain; 200 lits supplémentaires trouveront place dans la nouvelle construction. Egalement, à Ste-Agathe, le Sanatorium Laurentien sera pourvu d'une nouvelle aile de 150 à 200 lits additionnels.

A l'Institut Bruchési de Montréal, le Dr J.-A. Jarry a été réélu président du bureau d'administration et directeur médical. JEAN SAUCIER

General

The Bristol-Myers Co. of Canada have announced a program of employee security. It is composed of four parts, covering sickness and accident, with pensions for short-term, long-term and permanent disability. It also includes a comprehensive list of medical benefits, life insurance and unemployment insurance.

The Nichols Fellowship, Royal Society of Medicine. —Applications are invited for the above Fellowship the emoluments of which are at the rate of £200 per annum and £25 for expenses.

The research is to relate to the etiology, pathology, prevention or treatment of puerperal infection.

The applicants should give a précis of the proposed scope of the research and where it is to be carried out.

In the first instance the Fellowship shall be awarded for one year and may be continued for a second year after consideration of a report of the work already done.

Applications should reach the Secretary, Royal Society of Medicine, 1, Wimpole Street, London, W.1, not later than September 30, 1946.

BOOK REVIEWS

Hæmatology. W. M. Fowler, Professor of Internal Medicine, University of Iowa, Iowa City, with a chapter by E. L. Degowin, Assistant Research Professor of Medicine, University of Iowa, Iowa City. 499 pp., illust. $8.00. Paul B. Hoeber, Inc., New York, 1945.

The often-expressed plea of the practitioner and medical student for a reference text on this special subject combining clarity and conciseness of presentation and straightforward therapeutic directions with a minimum of confusing theories and opinions, is answered in this work by Dr. Fowler. The author has called upon a wide clinical experience to correlate the outstanding physical findings with the hæmatological changes in such a rational way that the reader is given a clear picture of the diagnostic features of the various blood disorders. There is an (understandable) lack of coloured plates demonstrating typical cellular changes.

The first six chapters deal with hæmatologic physiology and cytology. These, with an additional chapter, Hæmatology in Infants and Children, indicate the wide physiological range of normal blood findings in childhood and adult life.

The anæmias are presented in detail, with emphasis placed on classification according to etiological rather than morphological grounds. The chapter on pernicious anæmia and related macrocytic anæmias warrants special recommendation. Therapeutic measures are given briefly but simply.

The chapter on blood grouping and blood bank procedures by Dr. DeGowin is a concise and practical exposition of present knowledge in this rapidly-expanding field. Many points of value to those contemplating organization of blood banks are to be found in this section.

This text is highly recommended as a ready guide to the recognition and treatment of blood disease, especially valuable for non-specialists in this field.

Kettle's Pathology of Tumours. Revised by W. G. Barnard, Professor of Pathology, University of London, and A. H. T. Robb-Smith, Nuffield Reader in Pathology, University of Oxford. 3rd ed., 318 pp., illust. 21/-. H. K. Lewis & Co. Ltd., London, W.C.1, 1945.

The authors have tried to preserve the character of the original edition and provide a manual containing the generally accepted teaching on the pathology of tumours without the mass of detail proper in a more ambitious work of reference. The book is well thought-out and logically and clearly written. It is not likely to be of value to the undergraduate medical student, however, for it contains little that is not dealt with in standard pathological textbooks. It should prove a pleasant but not important addition to a pathologist's library. Perhaps it would be of greater value to the surgeon or radiologist interested in the general aspects of tumour pathology. The book is divided into three parts. The first part, 66 pages in length, deals with the general biology of tumours in a concise and thoughtful fashion. There are sections on definition, structure, growth, innocency and malignancy, multiple tumours, retrograde changes, dissemination, etiology and a particularly lucid exposition of trends in the experimental study of cancer. The second part, of 140 pages, is on the general pathology of tumours. A particularly valuable feature is the inclusion of Adami's embryological classification. There are, as well, sections on benign and malignant tumours of epithelial and connective tissues, on tumours of the central, peripheral and sympathetic nervous systems, on meningiomata, endotheliomata and teratomata. The third part of the book deals with the special pathology of tumours in 98 pages and therefore is little more than an index. The illustrations are mainly either microphotographs or line drawings of microscopic preparations.

The Physician's Business. G. D. Wolf, Assistant Clinical Professor of Otolaryngology, New York Medical College. 2nd ed., 433 pp., illust. $7.50. J. B. Lippincott Co., Montreal, 1945.

This is a very helpful book in many respects. In it Dr. Wolf has discussed all phases of the "business" of the physician. He opens his book with the young doctor leaving university and choosing his hospital for internship, and later choosing his career in medicine, *i.e.*, deciding whether he will specialize or carry on a general practice; and whether he will carry on a private practice or become associated with one of the medical services. He then discusses the setting up of an office and points out the advantages and disadvantages of various communities and types of practice. The detail of establishing an office is thoroughly considered. The chapter on The Doctor and his Patient is well worth reading. Many methods of filing histories and records are considered and very ably discussed. Techniques and procedures, which might be carried out in an office or a small hospital are well handled, but are not as important a portion of the book as that covering the particular business methods.

Every doctor about to start practice should read this book.